Final

Site Investigation Report
Former Motor Pool Area 3100,
Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)

Fort McClellan
Calhoun County, Alabama

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK10, Shaw Environmental, Inc. (Shaw) completed a site investigation (SI) at Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7) at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site as a result of historical mission-related Army activities. The SI consisted of the collection and analysis of six surface soil samples, one depositional soil sample, 13 subsurface soil samples, and 29 groundwater samples. Groundwater samples were collected from 16 monitoring wells installed at the site. In addition, Shaw removed three underground storage tanks (UST) at Former Motor Pool Area 3100. USTs, piping, and impacted soils were removed for a 2,500-gallon waste oil tank (Parcel 24[7]), a 3,000-gallon heating oil tank (Parcel 212[7]), and a 10,000-gallon diesel tank (Parcel 25[7]).

Chemical analysis of samples collected at the site indicates that metals, volatile organic compounds (VOC), semivolatile organic compounds, and benzene, toluene, ethylbenzene, and xylene (BTEX) compounds were detected in site media. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, the analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values at Fort McClellan. Site metals data were also evaluated using statistical and geochemical methods to select site-related metals.

Although the site is projected for mixed business reuse, the analytical data were screened against residential SSSLs to determine if the site is suitable for unrestricted reuse. Constituents detected at concentrations exceeding SSSLs and background (where available) were identified as chemicals of potential concern (COPC) in site media. COPCs included four metals (arsenic, chromium, iron, and manganese) in surface soil; six metals (aluminum, arsenic, chromium, iron, manganese, and nickel) and one polynuclear aromatic hydrocarbon (PAH) compound (benzo[a]pyrene) in subsurface soil; and four metals (barium, chromium, manganese, and nickel) and one VOC (benzene) in groundwater. With the exception of nickel in subsurface soil, the metals COPCs were determined to be present at naturally occurring levels. Although nickel exceeded its SSSL in one subsurface soil sample collected at 9 to 13 feet deep, all other nickel results in soil were below the SSSL and were determined to be present at naturally occurring levels. Nickel's status as a site-related constituent is questionable based on historical activities conducted at the site. Given the depth at which nickel was encountered and its limited spatial distribution in soil, nickel is not expected to pose a threat to human health. The PAH compound benzo(a)pyrene (0.086 milligrams per kilogram [mg/kg]) slightly exceeded its SSSL (0.085 mg/kg) in one subsurface soil sample collected from 8 to 12 feet deep at a location between the waste oil UST and the diesel UST. The USTs were removed, surrounding impacted soils were excavated, and confirmation sampling was performed in accordance with Alabama Department of Environmental Management UST closure requirements. Thus, only benzene in groundwater was retained as a human health chemical of concern.

Benzene concentrations (0.05 to 0.12 milligrams per liter [mg/L]) exceeded its SSSL (0.0014 mg/L) in four samples collected from monitoring well FTA-146-MW02 from February 2001 to January 2002. Monitoring well FTA-146-MW02 is adjacent to the location of the USTs that were removed in 2002. Data from the last three rounds of sampling at monitoring well FTA-146-MW02, collected prior to removal of the USTs, showed that the benzene concentrations in groundwater ranged from approximately 0.1 to 0.12 mg/L. The affected area is localized around FTA-146-MW02 and the source of the benzene has been removed. Benzene was also detected in one other permanent monitoring well (FTA-146-MW01) but at a level below its SSSL.

Constituents detected at concentrations exceeding ESVs and background (where available) were identified as constituents of potential ecological concern (COPEC) in surface soil. COPECs were ten metals (arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, selenium, and zinc) in a limited number of samples and five VOCs (1,2,4-trimethylbenzene, 1,2-dimethylbenzene, ethylbenzene, xylene, and toluene) in one sample. The metals COPECs were determined to be present at naturally occurring levels except for cobalt at one location and zinc at two locations. These locations appear to be isolated "hot spots." Similarly, the VOCs identified as COPECs were present at low levels exceeding ESVs at only one location. The COPECs identified at Motor Pool Area 3100 would have the potential to pose risks to ecological receptors living and feeding in the immediate vicinity of the hot spots if this area provided viable ecological habitat. However, the site is covered with buildings and concrete/asphalt pavement and does not provide ecological habitat. Furthermore, the projected reuse of this site will likely preclude future development of ecological habitat.

Based on the results of the SI, past operations at Former Motor Pool Area 3100 have impacted the environment. Benzene is present in groundwater at levels that may pose an unacceptable risk to human health. Furthermore, groundwater contamination (i.e., chlorinated VOCs) is being investigated at the Training Area T-5 sites, adjacent to Motor Pool Area 3100, and may be impacting groundwater in the southern portion of Parcel 146(7). Therefore, Shaw recommends implementing land-use controls to restrict groundwater use at Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7).

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC), located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted Shaw Environmental, Inc. (Shaw) (formerly IT Corporation [IT]) to perform the site investigation (SI) and underground storage tank (UST) closures at the Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7), under Contract Number DACA21-96-D-0018, Task Order CK10.

This report presents specific information and results compiled from the SI and the UST removal conducted at the Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7).

1.1 Project Description

Parcels 146(7), 212(7), 24(7), 25(7), and 73(7) were identified as areas to be investigated prior to property transfer. The parcels were classified as Category 7 parcels in the *Final Environmental Baseline Survey, Fort McClellan, Alabama* (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 parcels are areas that have not been evaluated or that require further evaluation.

A site-specific field sampling plan (SFSP) and a site-specific safety and health plan (SSHP) were finalized in September 1998 (IT, 1998a). A SFSP addendum was finalized in September 2000 (IT, 2000a), and a UST removal and closure report work plan addendum was finalized in October 2002 (IT, 2002a). These documents were prepared to provide technical guidance for SI and UST closure activities at the Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7). The SFSP and the SSHP were used as attachments to the installation-wide work plan (IT, 1998b) and the installation-wide sampling and analysis plan (SAP) (IT, 2000b; IT, 2002b). The UST removal and closure report work plan addendum was used as an attachment to the UST removal and closure report work plan (IT, 2000c). The SAP includes the installation-wide safety and health plan and quality assurance plan.

The SI was conducted in three phases and included collection and analyses of 6 surface soil samples, one depositional soil sample, 13 subsurface soil samples, and 29 groundwater samples over a 4-year period to determine whether potential site-specific chemicals are present at the site. In addition, 16 monitoring wells were installed at the site. The phased approach was the result of an interactive review process by the BRAC Cleanup team (BCT). Results of the intital SI activities (Phase I) were presented to the BCT in July 2000 and indicated that an elevated benzene concentration was observed in the groundwater sample from one temporary monitoring well. Based on the results of the initial investigation, the BCT agreed to supplemental SI activities (Phase II) consisting of installation of additional wells and sampling for benzene, toluene, ethyl benzene, and xylene (BTEX) analysis only. Analysis for other parameters (e.g., metals) was not considered necessary by the BCT. The results of the Phase II investigation were presented to the BCT in June 2001. The BCT reviewed the results and agreed to two quarterly groundwater sampling events of select monitoring wells (Phase III). Upon review of the Phase III groundwater sampling results, the BCT agreed in April 2002 that benzene concentrations in groundwater were relatively stable and that removal of three remaining USTs and potentially impacted soils would eliminate the source of benzene in groundwater.

Shaw's UST closure efforts included removal and disposal of a 2,500-gallon fiberglass waste oil UST and piping, a 3,000-gallon fiberglass heating oil UST and piping, and a 10,000-gallon fiberglass diesel UST, piping, and impacted soils. Confirmation sampling of the UST excavations and excavated soil stockpile sampling was also conducted. UST closure activities were conducted in accordance with Alabama Department of Environmental Management (ADEM) *UST Closure Site Assessments, Guidance Manual, Section III,* November 1997. The UST closure site assessment reports are included in Appendix A.

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7), at concentrations that pose an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by Shaw as part of human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs and ESVs are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000d). Background metals screening values are presented in the *Final Background Metals*

Survey Report, Fort McClellan, Alabama (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the BRAC Cleanup Team will decide either to propose "No Further Action" or to conduct additional work at the site.

1.3 Site Description and History

The Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7), is located on Rucker Street in the west-central portion of the Main Post (Figure 1-1). Building 3138 (former vehicle maintenance), Building 3142 (washrack), (Parcel 73[7]), and Building 3144 (former Tire Shop) are located at the site (Figure 1-2). The site covers approximately 5.2 acres. At the time of the EBS, light military vehicle maintenance was conducted inside Building 3138. Facility 3143 (an oil/water separator [OWS]) that is part of Parcel 73(7), is associated with the washrack and was initially built around 1969 with a baffle-type OWS. This facility was rebuilt in 1991 with a settling basin attached to a coalescing plate OWS that discharged to the sanitary sewer (ESE, 1998). A vehicle grease rack (3145) is also present. Other small buildings, including hazardous materials storage buildings formerly containing flammable materials and used batteries, were also located within this motor pool.

A 1973 aerial photograph shows a stain of unknown material, probably liquid, in the center of the motor pool. The stain appears to have resulted from a leaking tank or truck. The majority of the stain was located on the paved area in the center of the motor pool (FTMC 1973 photo 334-32) (ESE, 1998). Other information concerning this stain was not found during a second search conducted by Shaw.

The USTs closed at this site are listed in Table 1-1 and are shown on Figure 1-3. As indicated on Table 1-1, the three USTs replaced older USTs in the mid-1990s. The installation date of the original diesel tank is unknown. In review of ADEM reports for these older USTs, they appear to have been removed in accordance with ADEM UST requirements.

The EBS parcel numbers for this site are assigned as follows:

- Parcel 146(7) – Former Motor Pool Area 3100
- Parcel 212(7) – 3,000-gallon heating oil UST
- Parcel 24(7) – 2,500-gallon waste oil UST
- Parcel 25(7) – 10,000-gallon diesel UST
- Parcel 73(7) - washrack/OWS.

Table 1-1

Underground Storage Tanks
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Associated Parcel	Tank Contents	Tank Size (gal)	Tank Material	Date Installed	Date Removed	Notes
24(7)	Waste oil	2,000	Steel	1978	1994	1
		2,500	Fiberglass	1994	2002	2
25(7)	Diesel	10,000	Steel	unknown	1996	1
			Fiberglass	1996	2002	2
212(7)	Heating oil	5,000	Steel	1978	1996	1
		3,000	Fiberglass	1996	2002	2

Notes
1 - Source: EBS (ESE, 1998).
2 - Closure performed by Shaw. Closure reports located in Appendix A of this report.

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PROJ. NO.: 796887
INITIATOR: J. JENKINS
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
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STARTING DATE: 04/10/03
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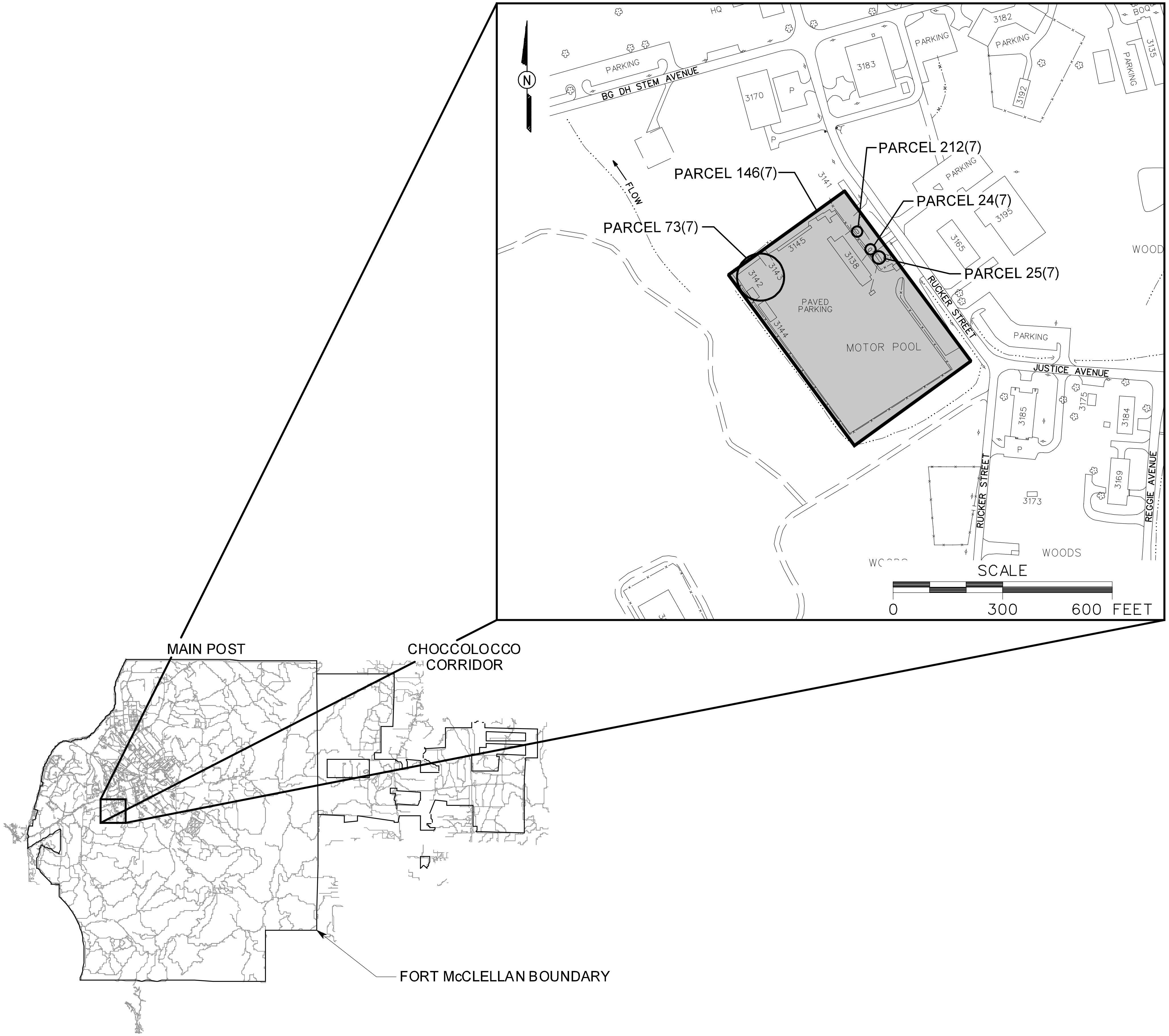

LEGEND

- UNIMPROVED ROADS
- PAVED ROADS / PARKING
- BUILDING
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- MANMADE SURFACE DRAINAGE FEATURE
- FENCE
- UTILITY POLE

FIGURE 1-1
SITE LOCATION MAP
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

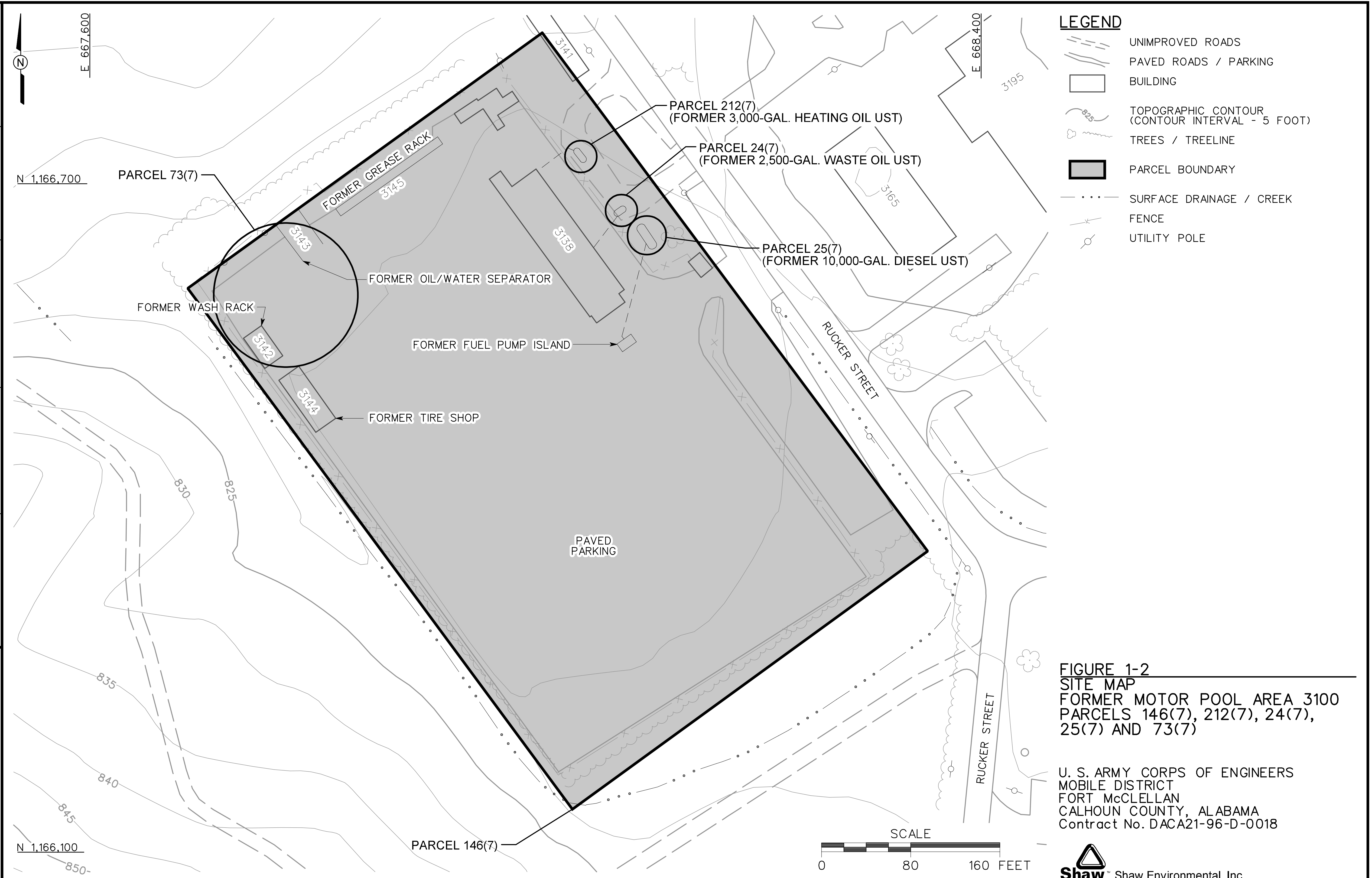

FIGURE 1-2
SITE MAP
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

DWG. NO.: ...\796887es.718
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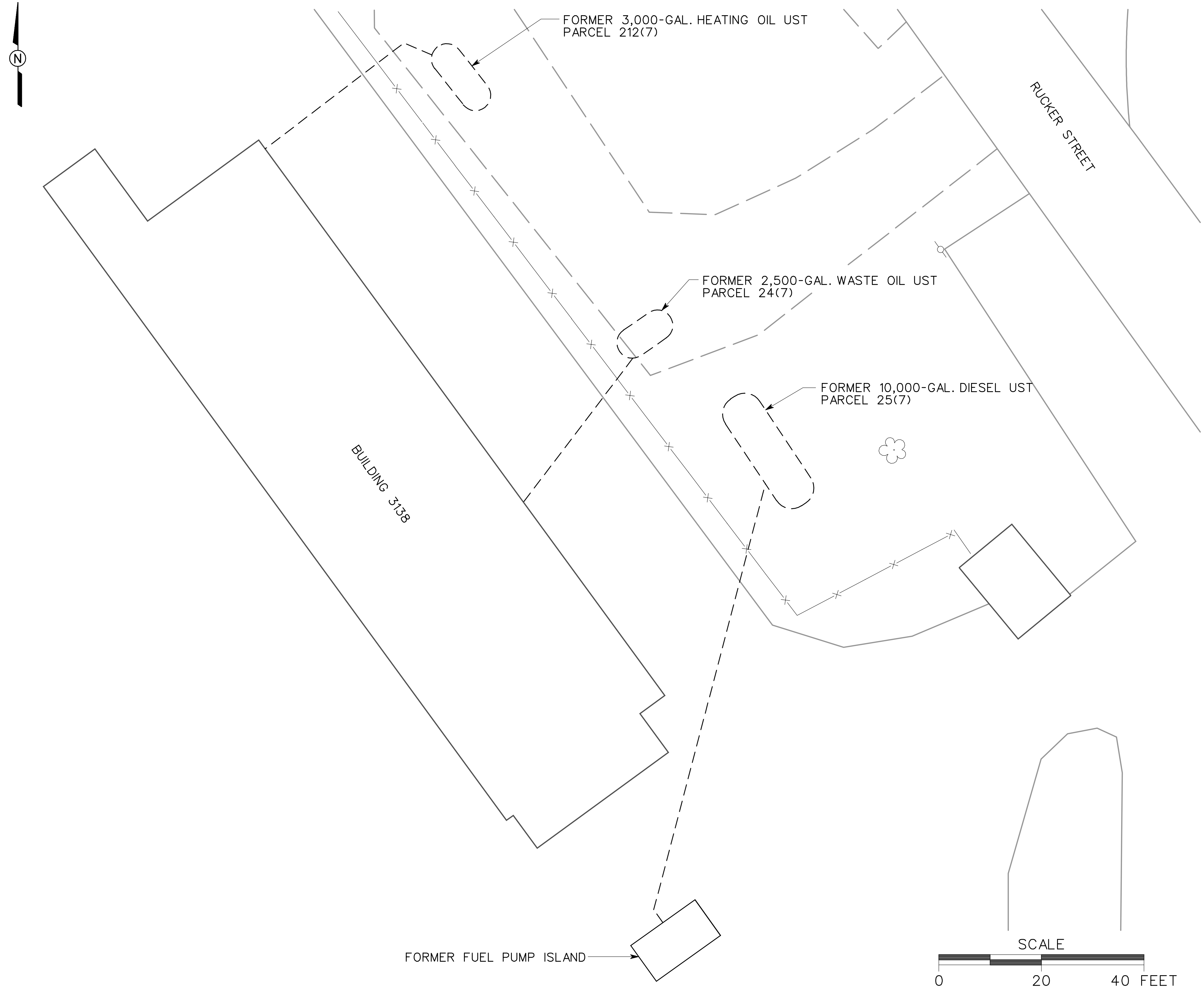

FIGURE 1-3
FORMER UST LOCATION MAP
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7),
25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw™ Shaw Environmental, Inc.

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PROJ. NO.: 796887
INITIATOR: J. JENKINS
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As agreed to by the BCT, Shaw conducted a three-phase SI at the Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7) consisting of the following investigations efforts:

- ***Phase I*** – Collection of six surface soil samples, one depositional soil sample, and thirteen subsurface soil samples and the installation and sampling of seven temporary monitoring wells

- ***Phase II*** – Installation and sampling of nine permanent monitoring wells

- ***Phase III*** – Two quarters of groundwater sampling of six monitoring wells to evaluate the potential migration and attenuation of BTEX in groundwater.

In addition to the SI, Shaw removed three USTs at Parcels 24(7), 25(7), and 212(7) in accordance with ADEM UST closure guidelines (Appendix A).

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The objective of the study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas).

2. Areas where only release or disposal of petroleum products has occurred.

3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response.

4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken.

5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken.

6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented.

7. Areas that are not evaluated or require additional evaluation.

The EBS was conducted in accordance with CERFA protocols (Public Law 102-426) and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, ADEM, the U.S. Environmental Protection Agency (EPA) Region 4, and Calhoun County, as well as a database search of CERCLA-regulated substances, petroleum products; and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels. Previous investigations have been conducted at Former Motor Pool Area 3100 as discussed in the following paragraphs.

A 2,000-gallon steel waste oil UST, located outside the chainlink fence northeast of Building 3138, was removed in 1994 (Table 1-1). Soil samples collected from the sidewalls of the excavation and from the pipe trench were analyzed for total petroleum hydrocarbons (TPH) and total lead. The samples from the sides of the excavation were at or the below detection limit for TPH of 100 milligrams per kilogram (mg/kg) in accordance with ADEM guidelines (Braun, 1995). However, high TPH concentrations were detected in the pipe trench, but significantly decreased in a second sample collected 2 feet away at the same depth. Also, an initial soil sample was collected at the bottom (11 feet) of the excavation showed elevated TPH concentrations. An additional soil sample was collected near the same location, but 3 feet below the initial sample. This sample showed much lower levels of TPH. Groundwater sampling was not conducted at this site. Groundwater was encountered when the excavation was extended to 5 feet below the bottom of the UST. Approximately 2 cubic yards of soil were removed from the excavation. The excavation was further enlarged for a 2,500-gallon fiberglass replacement tank. The closure report concluded that a petroleum hydrocarbon release had occurred and that the horizontal and vertical extent of contamination in the soil had not been determined (Braun, 1995).

A 10,000-gallon steel diesel UST was removed at Building 3138 in 1996 (ESE, 1998). Additional information was not provided in the EBS. The UST was replaced with a 10,000-gallon fiberglass tank.

A 5,000-gallon steel heating oil UST was removed at Building 3138 in 1996 (Southern Environmental Management & Specialties, 1997) (Table 1-1). A 3,000-gallon double-walled fiberglass tank (with interstitial monitoring) replaced the removed UST. Samples were not collected when the UST was removed. The excavation depth for the tank removal was not provided in the closure report.

Parcels 146(7), 212(7), 24(7), 25(7), and 73(7) were identified as Category 7 CERFA sites. These CERFA sites are parcels where petroleum products were stored, and possibly released onto the site or to the environment, and/or were disposed of on site property. The Former Motor Pool Area 3100 lacked adequate documentation and, therefore, required additional evaluation to determine its environmental condition.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by Shaw at the Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7), including environmental sampling and analysis and monitoring well installation activities. Shaw conducted the SI in three phases as follows:

- ***Phase I*** - Installation of seven temporary monitoring wells and collection and analysis of soil and groundwater samples.

- ***Phase II*** – Installation of nine permanent monitoring wells and collection and analysis of groundwater samples.

- ***Phase III*** - Quarterly sampling and analysis (October 2001 and January 2002) of six monitoring wells to define the migration of benzene in FTA-146-MW02.

Phase I field activities were initiated in October 1998 and were completed in January 1999. Based on the results of the analytical data, a supplemental SI was deemed necessary. The Phase II field activities were initiated in October 2000 and were completed in March 2001. Following completion of Phase II field activities, Shaw performed quarterly sampling events in October 2001 and January 2002 (Phase III). Six select wells were sampled during each quarterly sampling event to monitor elevated benzene concentrations in FTA-146-MW02 and to assess potential migration.

3.1 Environmental Sampling

Environmental sampling performed during the SI at Former Motor Pool Area 3100 included the collection of surface and depositional soil samples, subsurface soil samples, and groundwater samples for chemical analysis. Sample locations were determined by observing site physical characteristics during a site walk and by reviewing documents and aerial photographs pertaining to historical site activities. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figures 3-1 and 3-2. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.3.

3.1.1 Surface and Depositional Soil Sampling

Six surface soil samples and one depositional soil sample were collected at Former Motor Pool Area 3100, as shown on Figure 3-1. Soil sampling locations and rationale are presented in Table 3-1. Sample designations and analytical parameters are listed in Table 3-2. Sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, and site topography.

Table 3-1

Sample Locations and Rationale
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
FTA-146-GP01	Subsurface soil	A subsurface soil sample was collected adjacent to and north of the diesel UST to determine if the UST has leaked and if contaminated soil exists.
FTA-146-GP02	Subsurface soil and groundwater	Subsurface soil and groundwater samples were collected near the diesel UST. Sample data were used to determine if the UST has leaked and if contaminated soil or groundwater exists.
FTA-146-GP03	Subsurface soil	A subsurface soil sample was collected immediately north of the waste oil UST to determine if the UST has leaked and if contaminated soil exists.
FTA-146-GP04	Subsurface soil	A subsurface soil sample was collected approximately 30 feet north (downslope) of the heating oil UST to determine if the tank has leaked and if contaminated soil exists around the heating oil UST.
FTA-146-GP05	Surface soil, subsurface soil, and groundwater	Surface soil, subsurface soil, and groundwater samples were collected on the northern side of the grease rack (3145). Sample data were used to determine if potential site-specific chemicals (PSSC) were released during the motor pool operations.
FTA-146-GP06	Surface soil, subsurface soil, and groundwater	Surface soil, subsurface soil, and groundwater samples were collected immediately north of the oil/water separator (3143) to determine if any potential PSSCs were released to the environment in this area.
FTA-146-GP07	Surface soil, subsurface soil, and groundwater	Surface soil, subsurface soil, and groundwater samples were collected immediately east of the oil/water separator (3143) to determine if any potential PSSCs were released to the environment in this area.
FTA-146-GP08	Surface soil, subsurface soil, and groundwater	Surface soil, subsurface soil, and groundwater samples were collected just north of the fuel pump island located south of Building 3138. Sample data were used to indicate if any PSSCs were released to the environment near the fuel dispenser.
FTA-146-GP09	Surface soil, subsurface soil, and groundwater	Surface soil, subsurface soil, and groundwater samples were collected near the center of the parking lot southwest of Building 3138. Sample data were used to determine if PSSCs were released to the environment during motor pool operations or from the apparent spill seen on a 1973 aerial photograph.
FTA-146-GP10	Surface soil, subsurface soil, and groundwater	Surface soil, subsurface soil, and groundwater samples were collected approximately 30 feet northeast of the washrack (3142) to determine if PSSCs were released during motor pool operations or the apparent spill seen in a 1973 aerial photograph.
FTA-146-GP11	Subsurface soil	A subsurface soil sample was collected approximately 20 feet southeast of the heating oil UST to determine if the tank leaked and if contaminated soil exists.
FTA-146-GP12	Subsurface soil	A subsurface soil sample was collected in the area between the diesel UST and the waste oil UST to determine if the USTs leaked or if contaminated soil exists.
FTA-146-GP13	Subsurface soil	A subsurface soil sample was collected immediately east of the diesel UST to determine if the UST leaked and if contaminated soil exists.
FTA-146-MW01	Groundwater	A permanent residuum monitoring well was installed approximately 20 feet northwest of sample location FTA-146-GP03, and approximately 80 feet downgradient of temporary well FTA-146-GP02. Groundwater samples were collected and analyzed to determine the horizontal extent of benzene in groundwater.

Table 3-1

Sample Locations and Rationale
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
FTA-146-MW02	Groundwater	A permanent residuum monitoring well was installed adjacent to temporary well FTA-146-GP02, which was abandoned. Groundwater samples were collected and analyzed to confirm the presence of benzene in groundwater.
FTA-146-MW03	Groundwater	A permanent residuum monitoring well was installed approximately 60 feet southeast and upgradient of temporary well FTA-146-GP02. Groundwater samples were collected and analyzed to provide a data upgradient of FTA-146-GP02.
FTA-146-MW04	Groundwater	A permanent residuum monitoring well was installed approximately 60 feet west of temporary well FTA-146-GP02 on the eastern side of Building 3138. Groundwater samples were collected and analyzed to determine the horizontal extent of benzene in groundwater.
FTA-146-MW05	Groundwater	A permanent residuum monitoring well was installed approximately 110 feet east of temporary well FTA-146-GP02. Groundwater samples were collected and analyzed to define the horizontal extent of benzene in groundwater east of well FTA-146-GP02.
FTA-146-MW06	Groundwater	A permanent residuum monitoring well was installed approximately 175 feet north-northwest and downgradient of temporary well FTA-146-GP02. A groundwater sample was collected and analyzed to determine the horizontal extent of benzene in groundwater.
FTA-146-MW07	Groundwater	A permanent residuum groundwater monitoring well was installed approximately 175 feet northwest of well FTA-146-GP02. A groundwater sample was collected and analyzed to determine the horizontal extent of benzene in groundwater.
FTA-146-MW08	Groundwater	A permanent residuum groundwater monitoring well was installed adjacent to temporary well FTA-146-GP08, which was abandoned. A groundwater sample was collected and analyzed to determine the horizontal extent of benzene in groundwater.
FTA-146-MW09	Groundwater	A permanent bedrock monitoring well was installed adjacent to residuum well FTA-146-MW02. A groundwater sample was collected and analyzed to determine the vertical extent of benzene in groundwater.
FTA-146-DEP01	Depositional soil	A depositional soil sample was collected in a low area near the northwestern corner of the parcel to determine if PSSC are present as a result of surface water runoff from the site.

Table 3-2

Soil Sample Designations and Analytical Parameters
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Samples			Analytical Parameters
			Field Duplicates	Field Splits	MS/MSD	
FTA-146-GP01	FTA-146-GP01-DS-CP0001-REG	8-11.5	FTA-146-GP01-DS-CP0008-FD	FTA-146--GP01-DS-CP0009-FS		Metals, VOCs, and SVOCs.
FTA-146-GP02	FTA-146-GP02-DS-CP0002-REG	4-8				Metals, VOCs, and SVOCs.
FTA-146-GP03	FTA-146-GP03-DS-CP0003-REG	1-4				Metals, VOCs, and SVOCs.
FTA-146-GP04	FTA-146-GP04-DS-CP0004-REG	4-8	FTA-146-GP04-DS-CP0017-FD			Metals, VOCs, and SVOCs.
FTA-146-GP05	FTA-146-GP05-SS-CP0005-REG	0-1				Metals, VOCs, and SVOCs.
	FTA-146-GP05-DS-CP0006-REG	5-9				
FTA-146-GP06	FTA-146-GP06-SS-CP0007-REG	0-1				Metals, VOCs, and SVOCs.
	FTA-146-GP06-DS-CP0010-REG	9-13				
FTA-146-GP07	FTA-146-GP07-SS-CP0011-REG	0-1				Metals, VOCs, and SVOCs.
	FTA-146-GP07-DS-CP0012-REG	1-5				
FTA-146-GP08	FTA-146-GP08-SS-CP0013-REG	0-1				Metals, VOCs, and SVOCs.
	FTA-146-GP08-DS-CP0014-REG	5-9				
FTA-146-GP09	FTA-146-GP09-SS-CP0015-REG	0-1				Metals, VOCs, and SVOCs.
	FTA-146-GP09-DS-CP0016-REG	9-13				
FTA-146-GP10	FTA-146-GP10-SS-CP0019-REG	0-1				Metals, VOCs, and SVOCs.
	FTA-146-GP10-DS-CP0020-REG	9-13			FTA-146-GP10-DS-CP0020-MS/MSD	
FTA-146-GP11	FTA-146-GP11-DS-CP0021-REG	4-8				Metals, VOCs, and SVOCs.
FTA-146-GP12	FTA-146-GP12-DS-CP0022-REG	8-12				Metals, VOCs, and SVOCs.
FTA-146-GP13	FTA-146-GP13-DS-CP0023-REG	1-4				Metals, VOCs, and SVOCs.
FTA-146-DEP01	FTA-146-DEP01-DEP-CP0024-REG	0-1				Metals, VOCs, and SVOCs.

FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
VOC - Volatile organic compound.
SVOC - Semivolatile organic compound.
REG - Field sample.

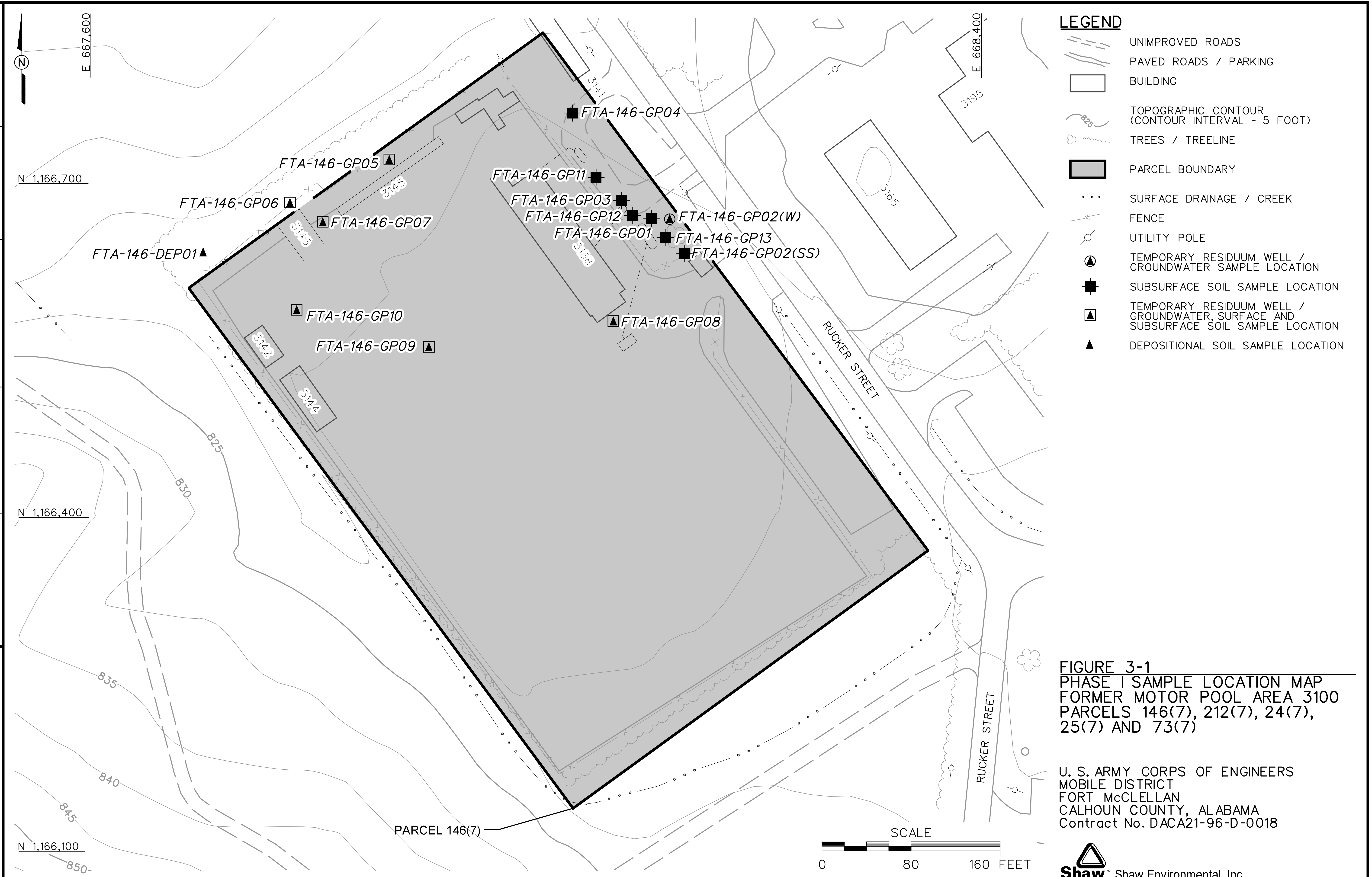
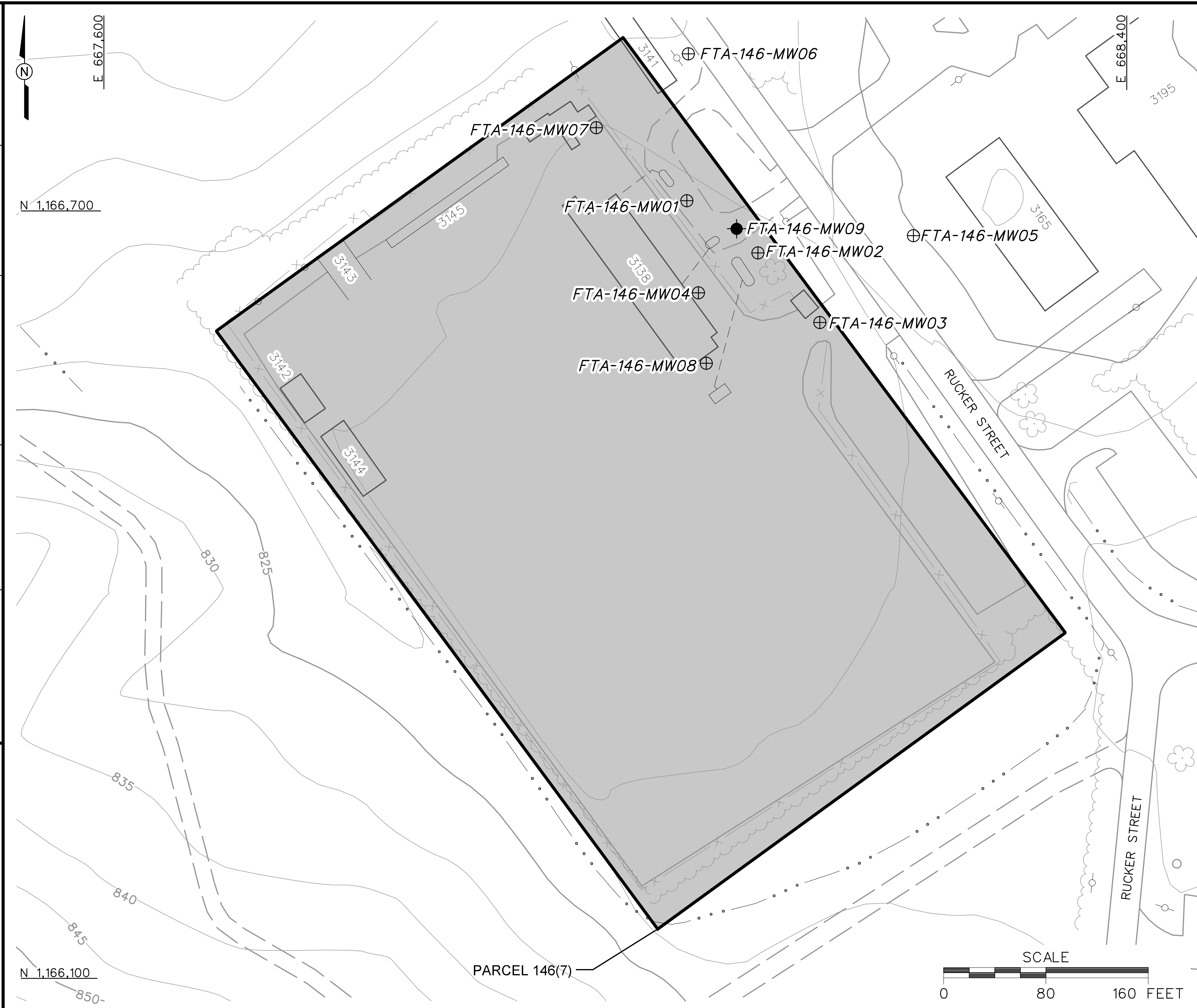


FIGURE 3-1
PHASE I SAMPLE LOCATION MAP
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

DWG. NO.: ...\796887es.720
PROJ. NO.: 796887
INITIATOR: J. JENKINS
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 04/10/03
DRAWN BY: D. BOMAR
5/11/2004 2:15:13 PM
dbomar c:\cadd\design\796887es.720



LEGEND

- UNIMPROVED ROADS
- PAVED ROADS / PARKING
- BUILDING
- TOPOGRAPHIC CONTOUR (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- RESIDUUM MONITORING WELL LOCATION
- BEDROCK MONITORING WELL LOCATION

NOTE:

1. MONITORING WELLS FTA-146-MW06, FTA-146-MW07, AND FTA-146-MW08 WERE NOT INCLUDED IN PHASE III SAMPLING.

FIGURE 3-2
PHASE II AND PHASE III
MONITORING WELL LOCATION MAP
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

DWG. NO.: ...\796887es.712
PROJ. NO.: 796887
INITIATOR: J. JENKINS
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 04/10/03
DRAWN BY: D. BOMAR
5/11/2004
2:21:00 PM
dbomar
c:\cadd\design\796887es.712

Sample Collection. Surface soil samples were collected from the uppermost foot of soil using a direct-push technology (DPT) sampling system in accordance with procedures presented in the SAP. Depositional soil samples were collected from the upper six inches of soil with a stainless-steel spoon. After the soil was collected with the sampling device, it was screened with a photoionization detector (PID) in accordance with procedures outlined in the SAP. The soil fraction for volatile organic compound (VOC) analysis was collected directly from the sample device using three EnCore® samplers. The remaining soil was then transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3.

3.1.2 Subsurface Soil Sampling

Subsurface soil samples were collected from 13 soil borings at Former Motor Pool Area 3100, as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Sample designations, depths, and analytical parameters are listed in Table 3-2. Soil boring locations were determined in the field by the on-site geologist based on sampling rationale, presence of surface structures, and site topography.

Sample Collection. Subsurface soil samples were collected from the borings at depths greater than one foot below ground surface (bgs) in the unsaturated zone. The borings were advanced and soil samples collected using a DPT sampling system in accordance with procedures presented in the SAP. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3.

Subsurface soil samples were collected continuously to 13 feet bgs or until DPT refusal was encountered. Samples were field screened using a PID to measure volatile organic vapors. The sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were below background, the deepest sample interval was submitted for analysis. The soil fraction for VOC analysis was collected directly from the sample device using three EnCore samplers. The remaining soil was then transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The on-site geologist constructed a detailed log for each soil boring (Appendix C). At the completion of soil sampling, the boreholes were abandoned with bentonite pellets and hydrated with potable water following borehole abandonment procedures summarized in the SAP.

3.1.3 Monitoring Well Installation

A total of 16 monitoring wells were installed at Former Motor Pool Area 3100 to collect groundwater samples for laboratory analysis. Seven temporary monitoring wells were installed during Phase I of the SI and nine permanent monitoring wells were installed during Phase II of the SI. The well locations are shown on Figure 3-1 (Phase I) and Figure 3-2 (Phase II). Table 3-3 summarizes construction details of the monitoring wells installed at the site. The well construction logs are included in Appendix C.

3.1.3.1 Residuum Monitoring Wells

Shaw contracted Miller Drilling Company, Inc. to install the seven temporary wells and eight permanent wells using a hollow-stem auger drill rig. The wells were installed following procedures outlined in the SAP. The borehole at each well location was advanced with a 4¼-inch ID hollow-stem auger from ground surface to the first water-bearing zone in the residuum. A 2-foot-long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. The on-site geologist logging the auger borehole continued the lithological log for each borehole from ground surface to the total depth of the borehole by logging the split-spoon samples. The split-spoon samples were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geologic and hydrogeologic information. The on-site geologist constructed a detailed lithological log for each soil boring. Soil characteristics were described using the "Burmeister Identification System" described in Hunt (1986) and the Unified Soil Classification System as outlined in the American Society for Testing and Materials (ASTM) Method D 2488 (ASTM, 2000). The boring logs are included in Appendix C.

Upon reaching the target depth in each borehole, a 15- or 20-foot length of 2-inch ID, 0.010-inch continuous slot, Schedule 40 PVC screen with a PVC end cap (or sump) was placed through the auger to the bottom of the borehole. The screen and end cap (or sump) were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A filter pack consisting of number 1 sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 2 feet above the top of the well screen as the augers were removed. The well was surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the sand pack occurred inside the borehole. A bentonite seal, consisting of approximately 2 feet of bentonite pellets, was placed immediately on top of the filter pack and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite pellets

Table 3-3

Monitoring Well Construction Summary
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Well Location	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Well Depth (ft bgs)	Screen Length (ft)	Screen Interval (ft bgs)	Well Material
FTA-146-GP02	1166666.70	668121.23	822.73	823.57	33.5	15	18.5 - 33.5	2" ID Sch. 40 PVC
FTA-146-GP05	1166720.35	667869.37	820.95	822.16	38	15	23 - 38	2" ID Sch. 40 PVC
FTA-146-GP06	1166681.75	667780.15	820.18	819.91	27	15	11.75 - 26.75	2" ID Sch. 40 PVC
FTA-146-GP07	1166664.40	667809.67	821.22	823.74	30	15	15 - 30	2" ID Sch. 40 PVC
FTA-146-GP08	1166575.18	668070.63	823.50	824.04	35	15	19.75 - 34.75	2" ID Sch. 40 PVC
FTA-146-GP09	1166551.91	667904.99	823.35	824.45	39	15	23.75 - 38.75	2" ID Sch. 40 PVC
FTA-146-GP10	1166585.25	667786.20	821.25	822.87	33	15	17.75 - 32.75	2" ID Sch. 40 PVC
FTA-146-MW01	1166706.89	668057.09	822.07	821.73	35	15	18 - 33	2" ID Sch. 40 PVC
FTA-146-MW02	1166666.09	668112.75	822.88	822.48	35.5	15	18.5 - 33.5	2" ID Sch. 40 PVC
FTA-146-MW03	1166611.61	668161.11	822.89	822.64	41	15	24 - 39	2" ID Sch. 40 PVC
FTA-146-MW04	1166634.81	668066.24	823.29	823.07	40	20	18 - 38	2" ID Sch. 40 PVC
FTA-146-MW05	1166679.48	668234.43	826.29	826.05	44	15	25 - 40	2" ID Sch. 40 PVC
FTA-146-MW06	1166821.65	668058.38	817.49	817.30	30	15	13 - 28	2" ID Sch. 40 PVC
FTA-146-MW07	1166763.94	667986.31	821.62	821.07	34	15	17 - 32	2" ID Sch. 40 PVC
FTA-146-MW08	1166579.70	668072.33	823.47	823.16	36	15	19 - 34	2" ID Sch. 40 PVC
FTA-146-MW09*	1166684.93	668096.00	822.49	822.28	72.7	10	59.3 - 69.3	4" ID Sch. 80 PVC

Permanent residuum wells installed using hollow-stem auger, except as noted.
* Bedrock monitoring well installed using air-rotary drilling and PQ wireline rock coring techniques.
Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983.
Elevations referenced to the North American Vertical Datum of 1988.
2" ID Sch. 40 PVC - 2-inch inside diameter, Schedule 40, polyvinyl chloride.
4" ID Sch. 80 PVC - 4-inch inside diameter, Schedule 80, polyvinyl chloride.
amsl - Above mean sea level.
bgs - Below ground surface.
ft - Feet

were allowed to hydrate in the groundwater. Bentonite seal placement and hydration followed procedures in the SAP. The remaining annular space of the permanent residuum wells was filled with bentonite-cement grout. The well surface completion at the permanent well locations included installing a protective steel casing and concrete surface pad around the PVC well casing. A locking well cap was placed on the protective steel casing.

The temporary residuum wells were covered with a protective temporary casing and secured with sandbags. A locking well cap was placed on the monitoring well cap.

3.1.3.2 Bedrock Monitoring Well

One bedrock monitoring well (FTA-146-MW09) was installed adjacent to residuum monitoring well FTA-146-MW02 at the site. The bedrock well was installed using a combination of air-rotary drilling and PQ wireline rock coring techniques. The borehole was drilled using a 12-inch ID tri-cone rotary bit coupled with a 7⅞-inch air percussion bit from ground surface to the total depth of the well (approximately 40 feet bgs). An 8-inch ID carbon steel International Pipe Standard outer casing was installed into the borehole from ground surface to 40.5 feet bgs. A minimum 2-inch annular space was maintained between the outer casing and the borehole wall. The outer casing was grouted in place using a tremie pipe suspended in the annulus outside the casing. Bentonite-cement grout was mixed using approximately 6.5 to 7 gallons of water and 5 pounds of bentonite per 94-pound bag of Type I or II Portland cement. The grout cured for a minimum of 48 hours before drilling continued. A triple PQ wireline core barrel was then used to collect core samples continuously from the bottom of the outer casing to the total depth of the borehole. After reaching the target depth, a 7⅞-inch air percussion bit was used to ream the borehole to the total depth of the boring.

Upon reaching the target depth of the borehole, a 10-foot-length of 4-inch ID, 0.010-inch continuous slot, Schedule 80 PVC screen with a 3-foot PVC sump was placed through the outer casing to the bottom of the borehole. The screen and sump were attached to 4-inch ID, flush-threaded Schedule 80 PVC riser. A filter pack consisting of number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 5 feet above the top of the well screen. The well was then surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the sand pack occurred inside the borehole. A bentonite seal, consisting of approximately 5 feet of bentonite pellets, was placed immediately on top of the filter pack and hydrated with potable water. Bentonite seal placement and hydration followed procedures in the SAP. Bentonite-cement grout was tremied into the remaining annular space of the well from the top of the bentonite seal to approximately ground surface. A locking protective steel casing was placed over the PVC well riser, and a concrete pad was constructed around the wellhead.

3.1.3.3 Well Development

The monitoring wells were developed by surging and pumping with a submersible pump in accordance with methodology outlined in the SAP. The submersible pump used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well to re-establish the natural hydraulic flow conditions. Development continued until the water turbidity was less than or equal to 20 nephelometric turbidity units (NTU), or for a maximum of 8 hours (2-inch wells) or 12 hours (4-inch wells). The well development logs are included in Appendix D.

3.1.4 Water Level Measurements

The depth to groundwater was measured in the wells at the site on three occasions: March 2000, January 2002, and November 2002. Water level measurements were made following procedures outlined in the SAP. Depth to groundwater was measured with an electronic water-level meter. The meter probe and cable were cleaned before use at each well following decontamination methodology presented in the SAP. Measurements were referenced to the top of the PVC well casing, as summarized in Table 3-4.

3.1.5 Groundwater Sampling

A total of 29 groundwater samples were collected from the 16 monitoring wells installed at Former Motor Pool Area 3100. Seven temporary wells were sampled during Phase I of the SI in December 1998 and January 1999 (Figure 3-1). Ten samples (including one resample at FTA-146-MW02) were collected from the permanent monitoring wells installed during Phase II of the SI conducted in 2001 (Figure 3-2). In October 2001 and January 2002, Shaw conducted the Phase III quarterly sampling at the site. During each quarterly sampling event, six monitoring wells were sampled: FTA-146-MW01 through FTA-146-MW05 and FTA-146-MW09 (Figure 3-2). The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and analytical parameters are listed in Table 3-5.

Sample Collection. The groundwater samples were collected using a mechanical pump (i.e., peristaltic, bladder, or submersible pump) equipped with Teflon™ tubing, or a Teflon™ bailer following procedures outlined in the SAP. Samples for VOC analysis were collected with a bailer or using the “tube evacuation” method when a peristaltic pump was used for sampling (IT, 2002b). Groundwater was sampled after purging a minimum of three well volumes and after field parameters (i.e., temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Field parameters were measured using a calibrated water-quality meter, as summarized in Table 3-6. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

3.1.6 Well Abandonment

During Phase II of the SI, two temporary residuum wells (FTA-146-GP02 and FTA-146-GP08) were abandoned. Well abandonment procedures followed procedures outlined in the SAP. The wells were abandoned by removing the PVC riser and screen from the borehole, adding bentonite chips to ground surface, and hydrating with potable water. The well abandonment forms are included in Appendix E.

Based on discussions at the November 2002 BCT meeting, the remaining temporary residuum wells were converted to groundwater elevation piezometers by filling the annular space with hydrated bentonite chips.

3.2 Surveying of Sample Locations

Sample locations were surveyed using global positioning system and conventional civil survey techniques described in the SAP. Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix F.

3.3 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters based on potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Samples collected at Former Motor Pool Area 3100 were analyzed using EPA SW-846 methods, including Update III methods where applicable.

The Phase I soil and groundwater samples were analyzed for the following parameters:

- Target analyte list metals – EPA Methods 6010B/7470A/7471A
- Target compound list (TCL) VOCs – EPA Method 8260B
- TCL semivolatile organic compounds (SVOC) – EPA Method 8270C.

Table 3-4

Groundwater Elevations
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Well Location	Date	Top of Casing Elevation (ft amsl)	Ground Elevation (ft amsl)	Depth to Water (ft BTOC)	Groundwater Elevation (ft amsl)
FTA-146-GP02*	14-Mar-00	823.57	822.73	16.33	807.24
FTA-146-GP05	14-Mar-00	822.16	820.95	16.00	806.16
	8-Jan-02			17.49	804.67
	27-Nov-02			14.11	808.05
FTA-146-GP06	14-Mar-00	819.91	820.18	14.75	805.16
	8-Jan-02			16.37	803.54
	27-Nov-02			13.25	806.66
FTA-146-GP07	14-Mar-00	823.74	821.22	17.71	806.03
	8-Jan-02			19.08	804.66
	27-Nov-02			15.68	808.06
FTA-146-GP08*	14-Mar-00	824.04	823.50	17.32	806.72
FTA-146-GP09	14-Mar-00	824.45	823.35	18.31	806.14
	8-Jan-02			18.25	806.20
	27-Nov-02			12.15	812.30
FTA-146-GP10	14-Mar-00	822.87	821.25	17.21	805.66
	8-Jan-02			17.07	805.80
	27-Nov-02			12.74	810.13
FTA-146-MW01	8-Jan-02	821.73	822.07	15.55	806.18
	27-Nov-02			7.61	814.12
FTA-146-MW02	8-Jan-02	822.48	822.88	15.57	806.91
	27-Nov-02			10.93	811.55
FTA-146-MW03	8-Jan-02	822.64	822.89	15.78	806.86
	27-Nov-02			10.80	811.84
FTA-146-MW04	8-Jan-02	823.07	823.29	16.18	806.89
	27-Nov-02			11.53	811.54
FTA-146-MW05	8-Jan-02	826.05	826.29	18.82	807.23
	27-Nov-02			13.74	812.31

Table 3-4

Groundwater Elevations
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Well Location	Date	Top of Casing Elevation (ft amsl)	Ground Elevation (ft amsl)	Depth to Water (ft BTOC)	Groundwater Elevation (ft amsl)
FTA-146-MW06	8-Jan-02	817.30	817.49	10.82	806.48
	27-Nov-02			6.44	810.86
FTA-146-MW07	8-Jan-02	821.07	821.62	15.58	805.49
	27-Nov-02			11.55	809.52
FTA-146-MW08	8-Jan-02	823.16	823.47	16.32	806.84
	27-Nov-02			NA	NA
FTA-146-MW09	8-Jan-02	822.28	822.49	15.57	806.71
	27-Nov-02			11.10	811.18

* Well abandoned in November 2000.

Elevations referenced to the North American Vertical Datum of 1988.

amsl - Above mean sea level
BTOC - Below top of casing
ft - Feet
NA - Not available

Table 3-5

Groundwater Sample Designations and Analytical Parameters
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	QA/QC Samples Field Duplicates	QA/QC Samples Field Splits	QA/QC Samples MS/MSD	Analytical Parameters
FTA-146-GP02	FTA-146-GP02-GW-CP3002-REG				Metals, VOCs, and SVOCs
FTA-146-GP05	FTA-146-GP05-GW-CP3005-REG				Metals, VOCs, and SVOCs
FTA-146-GP06	FTA-146-GP06-GW-CP3006-REG				Metals, VOCs, and SVOCs
FTA-146-GP07	FTA-146-GP07-GW-CP3009-REG	FTA-146-GP07-GW-CP3007-FD	FTA-146-GP07-GW-CP3008-FS	FTA-146-GP07-GW-CP3009-MS/MSD	Metals, VOCs, and SVOCs
FTA-146-GP08	FTA-146-GP08-GW-CP3010-REG				Metals, VOCs, and SVOCs
FTA-146-GP09	FTA-146-GP09-GW-CP3011-REG				Metals, VOCs, and SVOCs
FTA-146-GP10	FTA-146-GP10-GW-CP3012-REG				Metals, VOCs, and SVOCs
FTA-146-MW01	FTA-146-MW01-GW-CPP3001-REG			FTA-146-MW01-GW-CPP3001-MS/MSD	BTEX
	FTA-146-MW01-GW-OCP3001-REG				
	FTA-146-MW01-GW-OCP3007-REG				
FTA-146-MW02	FTA-146-MW02-GW-CPP3002-REG				BTEX
	FTA-146-MW02-GW-CPP3002R-REG				
	FTA-146-MW02-GW-OCP3002-REG				
	FTA-146-MW02-GW-OCP3008-REG				
FTA-146-MW03	FTA-146-MW03-GW-CPP3003-REG				BTEX
	FTA-146-MW03-GW-OCP3003-REG				
	FTA-146-MW03-GW-OCP3009-REG				
FTA-146-MW04	FTA-146-MW04-GW-CPP3006-REG				BTEX
	FTA-146-MW04-GW-OCP3004-REG				
	FTA-146-MW04-GW-OCP3010-REG				
FTA-146-MW05	FTA-146-MW05-GW-CPP3007-REG				BTEX
	FTA-146-MW05-GW-OCP3005-REG				
	FTA-146-MW05-GW-OCP3011-REG				
FTA-146-MW06	FTA-146-MW06-GW-CPP3008-REG	FTA-146-MW06-GW-CPP3004-FD			BTEX
FTA-146-MW07	FTA-146-MW07-GW-CPP3009-REG				BTEX
FTA-146-MW08	FTA-146-MW08-GW-CPP3010-REG				BTEX
FTA-146-MW09	FTA-146-MW09-GW-CPP3011-REG				BTEX
	FTA-146-MW09-GW-OCP3006-REG				
	FTA-146-MW09-GW-OCP3012-REG				

BTEX - Benzene, toluene, ethylbenzene, xylene.
FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.

Table 3-6

Groundwater Field Parameters
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Date	Specific Conductivity (mS/cm)[a]	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)	Turbidity (NTU)	pH (SU)
FTA-146-GP02	15-Dec-98	0.116	0.47	91	18.2	5	5.37
FTA-146-GP05	17-Dec-98	0.118	0.83	-46	18.8	134	6.25
FTA-146-GP06	8-Jan-99	0.122	0.71	83	18.2	35	5.75
FTA-146-GP07	17-Dec-98	0.159	0.64	93	18.8	18.7	5.77
FTA-146-GP08	16-Dec-98	0.209	0.60	2	20.9	174	6.80
FTA-146-GP09	16-Dec-98	0.106	1.60	100	21.3	15.8	5.43
FTA-146-GP10	16-Dec-98	0.095	0.26	74	20.2	112	5.36
FTA-146-MW01	28-Feb-01	0.061	3.09	250	18.7	10	4.43
	4-Oct-01	0.040	4.42	120	20.9	5.1	4.67
	22-Jan-02	0.052	NR	310	18.6	3.9	4.04
FTA-146-MW02	28-Feb-01	0.222	6.00	20	16.7	7	5.72
	17-Jul-01	0.219	6.82	-43	25.8	1.4	5.97
	4-Oct-01	0.199	3.28	5	20.5	0.4	5.33
	22-Jan-02	0.268	NR	-107	18.8	1.4	5.45
FTA-146-MW03	1-Mar-01	0.092	1.87	180	22.9	18	6.09
	5-Oct-01	0.080	4.23	40	22.1	10.3	5.39
	24-Jan-02	0.109	2.87	111	20.8	18.4	5.76
FTA-146-MW04	2-Mar-01	0.526	8.58	185	19.7	9	5.65
	16-Oct-01	0.068	12.97[b]	131	21.0	1.1	5.04
	25-Jan-02	0.077	5.00	197	19.6	4.5	4.95
FTA-146-MW05	15-Feb-01	0.271	9.46	220	19.2	31.2	5.60
	10-Oct-01	0.061	8.65	79	22.8	11.4	5.83
	24-Jan-02	0.071	NR	144	19.0	14.5	5.30
FTA-146-MW06	28-Feb-01	0.463	8.85	215	17.7	4	5.59
FTA-146-MW07	2-Mar-01	0.549	8.59	235	19.1	13	5.29
FTA-146-MW08	2-Mar-01	0.288	7.99	250	20.2	10	6.86
FTA-146-MW09	1-Mar-01	0.126	3.29	55	17.2	4	5.61
	11-Oct-01	0.176	1.91	-27	19.0	1.5	5.85
	23-Jan-02	0.159	NR	-53	19.5	0.7	6.21

[a] Specific conductivity values standardized to millisiemens per centimeter.
[b] Elevated dissolved oxygen reading due to air in purging/sampling equipment.

°C - Degrees Celsius.
GW - Groundwater.
mg/L - Milligrams per liter.
mS/cm - Millisiemens per centimeter.
mV - Millivolts.
NR - Not recorded.
NTU - Nephelometric turbidity units.
ORP - Oxidation-reduction potential.
SU - Standard units.

Groundwater samples collected during Phases II and III were analyzed for BTEX only (EPA Method 8021B).

3.4 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in the SAP. Sample documentation and chain-of-custody records were completed as specified in the SAP.

Completed analysis and chain-of-custody records (Appendix B) were included with each shipment of sample coolers to either Quanterra Environmental Services in Knoxville, Tennessee or EMAX Laboratories, Inc. in Torrance, California. Split samples were shipped to the USACE South Atlantic Division Laboratory in Marietta, Georgia.

3.5 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in the SAP. The IDW generated during the SI at Former Motor Pool Area 3100 was segregated as follows:

- Soil boring cuttings
- Decontamination fluids and purge water from well development and sampling
- Personal protective equipment and spent well materials.

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analysis. Based on the results, soil boring cuttings, spent well materials, and personal protective equipment generated during the field activities were disposed as nonhazardous waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the 20,000-gallon sump associated with the Building T-338 vehicle washrack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonhazardous waste to the FTMC wastewater treatment plant on the Main Post.

3.6 Variances/Nonconformances

Two variances to the SFSPs were recorded during completion of the SI at Former Motor Pool Area 3100. The variances did not alter the intent of the investigation or the sampling rationale presented in the SFSPs. The variances are summarized in Table 3-7 and the variance reports are included in Appendix G.

No nonconformances to the SFSPs were recorded during completion of the SI.

3.7 Data Quality

The field sample analytical data are presented in tabular form in Appendix H. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the site-specific work plans; the FTMC SAP and quality assurance plan; and standard, accepted methods and procedures. Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 2001) and the stipulated requirements for the generation of definitive data presented in the SAP. Chemical data were reported by the laboratory via hard-copy data packages using Contract Laboratory Program-like forms.

Data Validation. The reported analytical data were validated in accordance with EPA National Functional Guidelines by Level III criteria. Appendix I includes the data validation summary reports that discuss the results of the validation. Selected results were qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the reports. The validation-assigned qualifiers were added to the FTMC ShawView™ database for tracking and reporting. The qualified data were used in comparisons to the SSSLs and ESVs. Rejected data (assigned an "R" qualifier) were not used in the comparisons to the SSSLs and ESVs. The data presented in this report, except where qualified, meet the principle data quality objective for this investigation.

Table 3-7

Variances to the Site-Specific Field Sampling Plan
Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7)
Fort McClellan, Calhoun County, Alabama

Variance to the SFSP	Justification for Variance	Impact to Site Investigation
Temporary wells FTA-146-GP02, FTA-146-GP05, FTA-146-GP06, FTA-146-GP07, FTA-146-GP08, FTA-146-GP09, and FTA-146-GP10 were not installed using direct-push technology as proposed in the SFSP.	Unable to install temporary wells using direct-push technology because groundwater was not encountered during drilling operations. The temporary wells were installed using a hollow-stem auger drill rig.	None. The temporary groundwater monitoring wells were successfully installed using a hollow-stem auger drill rig.
Temporary well FTA-146-GP02 was relocated approximately 30 feet north of its proposed location.	The hollow-stem auger drill rig used to install FTA-146-GP02 could not access the original direct-push soil boring location because of overhead power lines and buried underground utility lines.	None. The temporary groundwater monitoring well was installed in the vicinity of a UST at Motor Pool Area 3100 and provided sufficient data to characterize groundwater quality at the site.

SFSP - Site-specific field sampling plan.

4.0 Site Characterization

Subsurface investigations performed at Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7), provided soil, geologic, and groundwater data used to characterize the geology and hydrogeology of the site.

4.1 Regional and Site Geology

4.1.1 Regional Geology

Calhoun County includes parts of two physiographic provinces: the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992) and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County it is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish gray siltstone and mudstone. Massive to laminated greenish gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Osborne et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest of the Main Post and consists of interlayered bluish gray or pale yellowish gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline, porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post, as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish red-purple mudstone, shale, siltstone, and greenish red and light gray sandstone, with locally occurring limestone and dolomite. Weaver Cave, located approximately one mile west of the northwest boundary of the Main Post, is situated in gray dolomite and limestone mapped as the Rome Formation (Osborne et al., 1997). The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark gray, finely to coarsely crystalline, medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped as undifferentiated at FTMC and in other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites, and limestones and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Osborne, et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark to light gray limestone with abundant chert nodules and greenish gray to grayish red phosphatic shale, with increasing amounts of calcareous chert towards the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale based on fossil data.

The Pennsylvanian Parkwood Formation overlies the Floyd Shale and consists of a medium to dark gray, silty clay, shale, and mudstone with interbedded light to medium gray, very fine to fine grained, argillaceous, micaceous sandstone. Locally the Parkwood Formation also contains beds of medium to dark gray, argillaceous, bioclastic to cherty limestone and beds of clayey coal up to a few inches thick (Raymond et al., 1988). The Parkwood Formation in Calhoun County is generally found within a structurally complex area known as the Coosa deformed belt. In the deformed belt, the Parkwood Formation and Floyd Shale are mapped as undifferentiated because their lithologic similarity and significant deformation make it impractical to map the contact (Thomas and Drahovzal, 1974; Osborne et al., 1988). The undifferentiated Parkwood Formation and Floyd Shale are found throughout the western quarter of Pelham Range.

The Jacksonville thrust fault is the most significant structural geological feature in the vicinity of the Main Post of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama, and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded window, or fenster, in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation; north by the Conasauga Formation; northeast, east, and southwest by the Shady Dolomite; and southeast and southwest by the Chilhowee Group (Osborne et al., 1997). Two small klippen of the Shady Dolomite, bounded by the Jacksonville fault, have been recognized adjacent to the Pell City fault at the FTMC window (Osborne et al., 1997).

The Pell City fault serves as a fault contact between the bedrock within the FTMC window and the Rome and Conasauga Formations. The trace of the Pell City fault is also exposed approximately nine miles west of the FTMC window on Pelham Range, where it traverses northeast to southwest across the western quarter of Pelham Range. Here, the trace of the Pell City fault marks the boundary between the Pell City thrust sheet and the Coosa deformed belt.

The eastern three-quarters of Pelham Range is located within the Pell City thrust sheet, while the remaining western quarter of Pelham Range is located within the Coosa deformed belt. The Pell

City thrust sheet is a large-scale thrust sheet containing Cambrian and Ordovician rocks and is relatively less structurally complex than the Coosa deformed belt (Thomas and Neathery, 1982). The Pell City thrust sheet is exposed between the traces of the Jacksonville and Pell City faults along the western boundary of the FTMC window and along the trace of the Pell City fault on Pelham Range (Thomas and Neathery, 1982; Osborne et al., 1988). The Coosa deformed belt is a narrow northeast-to-southwest-trending linear zone of complex structure (approximately 5 to 20 miles wide and approximately 90 miles in length) consisting mainly of thin imbricate thrust slices. The structure within these imbricate thrust slices is often internally complicated by small-scale folding and additional thrust faults (Thomas and Drahovzal, 1974).

4.1.2 Site Geology

The soil at Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7) is mapped as Anniston and Allen gravelly loam. This soil type is typically developed in old alluvium found along the foot slopes and alluvial fans of the larger hills in the region. The color of the surface soil ranges from dark brown to reddish brown and the subsurface soil is generally a reddish-brown. The soil consists of a gravelly clay loam to clay or silty clay loam (U.S. Department of Agriculture [USDA], 1961).

The residuum encountered during drilling activities at Former Motor Pool Area 3100 consisted of light brown to reddish brown, yellowish brown to gray and greenish gray clay with varying amounts of silt and gravel (Appendix C). This description is consistent with the Anniston and Allen Series soils. The residuum extends from ground surface to approximately 20 to 25 feet bgs.

As shown on Figure 4-1, bedrock at Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7), is mapped as undifferentiated Mississippian/Ordovician Floyd and Athens Shale. Floyd Shale consists of thin-bedded, fissile, brown to black shale with thin intercalated limestone layers and interbedded sandstone. The Athens Shale consists of dark gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989).

Based on the drilling log for the bedrock monitoring well FTA-146-MW09, grayish black, moderately weathered, fissile shale with quartz veins was encountered at approximately 20 feet bgs (Appendix C). This grayish black shale is consistent with the characteristics of the undifferentiated Mississippian/Ordovician Floyd and Athens Shale.

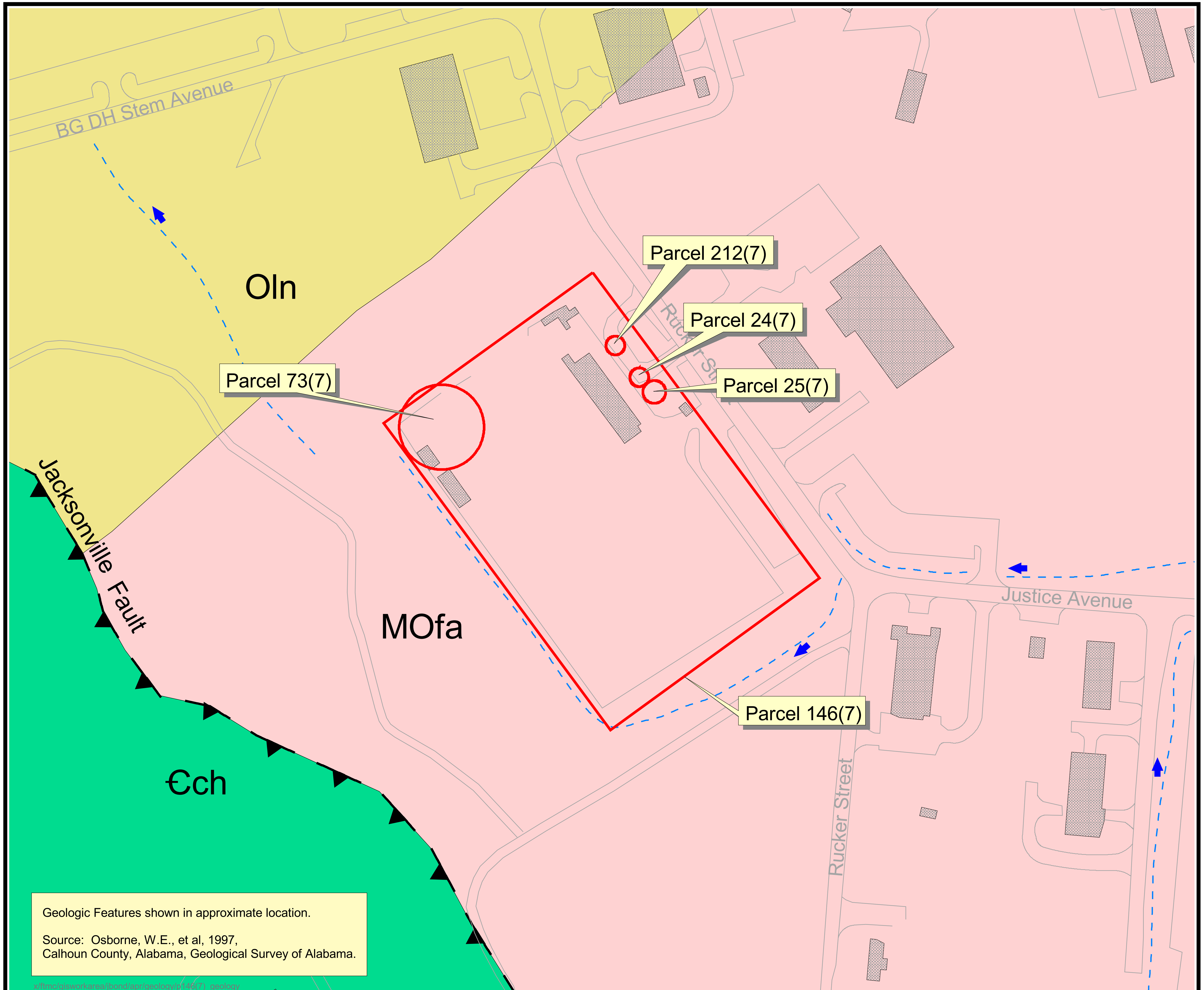


Figure 4-1

Site Geologic Map

Former Motor Pool Area 3100,
Parcel 146(7)
Fort McClellan, Alabama

Legend

Area of Investigation

Roads

Surface Drainage Feature (dashed where intermittent; arrow indicates flow direction)

Building

Geology

MOfa — Mississippian/Ordovician - Floyd and Athens Shale, undifferentiated

Oln — Ordovician - Little Oak and Newala Limestones, undifferentiated

€ch — Cambrian - Chilhowee Group, undifferentiated

Thrust Fault (dashed where inferred; barbs on upper plate)

150 0 150 Feet

NAD83 State Plane Coordinates

N

Shaw™ Shaw Environmental, Inc.

U.S. Army Corps of Engineers Mobile District

Contract No. DACA21-96-D-0018

4.2 Site Hydrology

4.2.1 Surface Hydrology

Precipitation in the form of rainfall averages about 53 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of Commerce, 1998). The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

Former Motor Pool Area 3100 is approximately 815 feet above mean sea level and is relatively flat. Elevation decreases to the northwest in the vicinity of the parcel. Surface water runoff appears to follow the topography and flows to the northwest.

4.2.2 Hydrogeology

Groundwater was encountered at approximately 20 feet bgs during drilling activities at Parcel 146(7) (Appendix C). Static groundwater levels were measured in monitoring wells at the site in March 2000 and in January and November 2002, as summarized in Table 3-4. Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. As shown on Figures 4-2, 4-3, and 4-4, the general groundwater flow direction is to the northwest, corresponding with the site topography. The groundwater elevation data collected in November 2002 occurred during a period of increased rainfall. The groundwater elevations range from approximately 2 to 8 feet higher than the groundwater elevations in March 2000 and January 2002. Localized mounding observed in FTA-146-MW01 is influenced by the nearby UST vaults filled with pea gravel that act as a "bathtub" for infiltration from precipitation events.

Static groundwater levels summarized in Table 3-4 are at shallower depths than the depth to groundwater encountered during drilling (Appendix C). In clayey residual soil, water is typically encountered during drilling at a depth below the actual static water level.

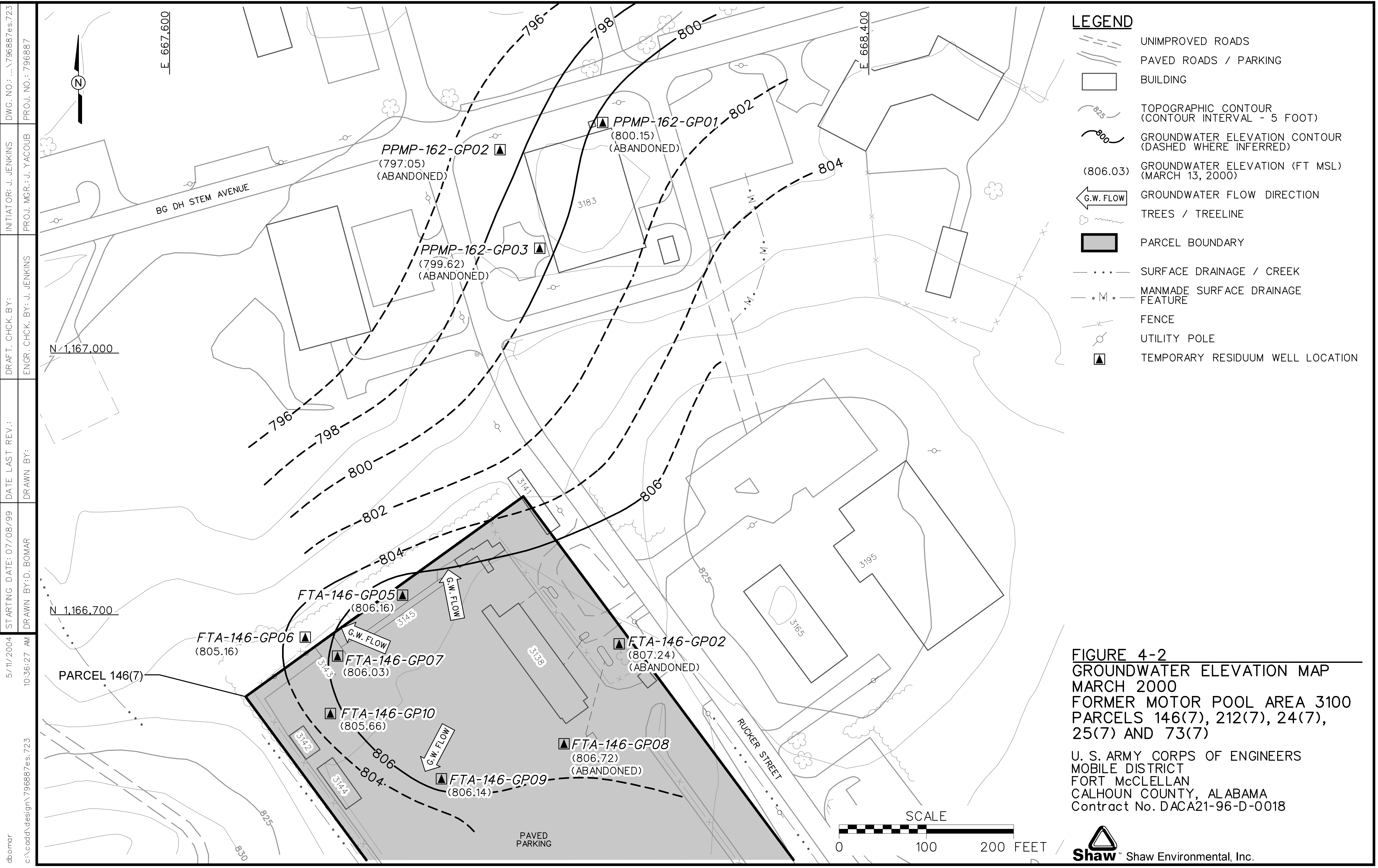


FIGURE 4-2
GROUNDWATER ELEVATION MAP
MARCH 2000
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

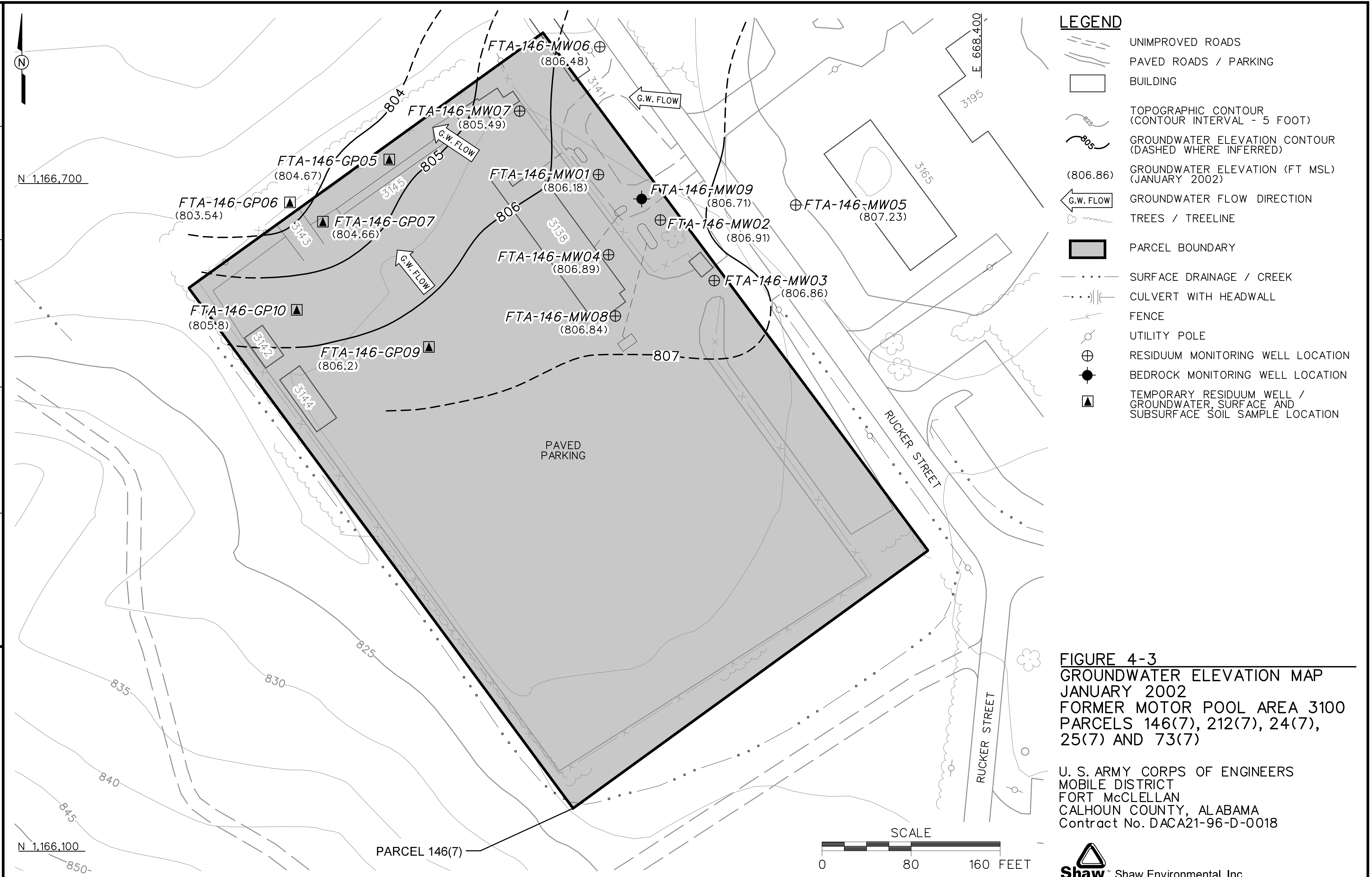


FIGURE 4-3
GROUNDWATER ELEVATION MAP
JANUARY 2002
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

DWG. NO.: ...\796887es.540
PROJ. NO.: 796887
INITIATOR: J. JENKINS
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 04/10/03
DRAWN BY: D. BOMAR
5/11/2004 2:08:00 PM
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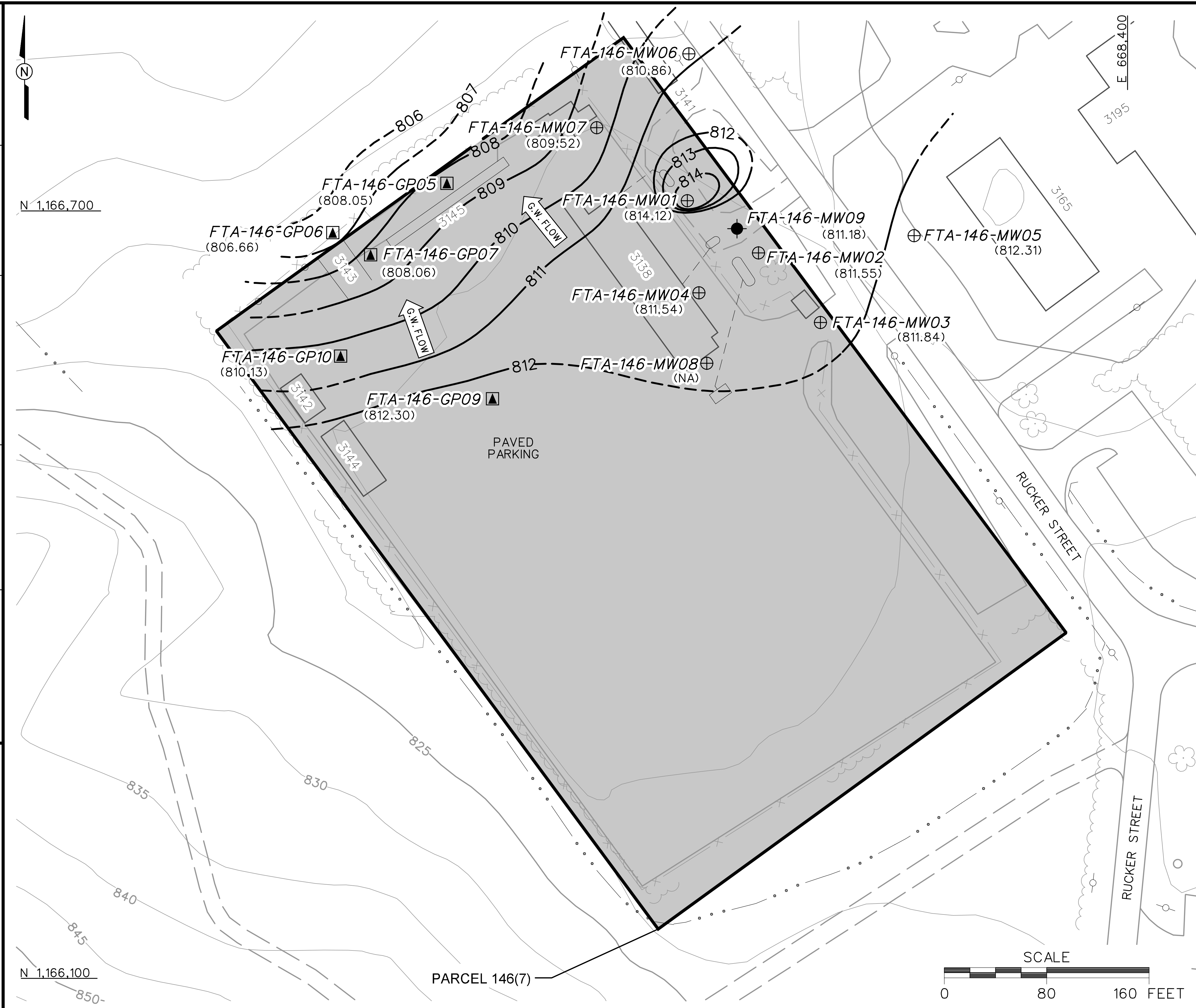

LEGEND

- UNIMPROVED ROADS
- PAVED ROADS / PARKING
- BUILDING
- TOPOGRAPHIC CONTOUR (CONTOUR INTERVAL - 5 FOOT)
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
- (808.06) GROUNDWATER ELEVATION (FT MSL) (NOVEMBER 27, 2002)
- GROUNDWATER FLOW DIRECTION
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- CULVERT WITH HEADWALL
- FENCE
- UTILITY POLE
- RESIDUUM MONITORING WELL LOCATION
- BEDROCK MONITORING WELL LOCATION
- TEMPORARY RESIDUUM WELL / GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- NA DATA NOT AVAILABLE

FIGURE 4-4
GROUNDWATER ELEVATION MAP
NOVEMBER 2002
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

DWG. NO.: ...\796887es.633 | PROJ. NO.: 796887
INITIATOR: J. JENKINS | PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY: | ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 12/04/02 | DRAWN BY: D. BOMAR
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5.0 Summary of Analytical Results

The results of chemical analysis of the samples collected at Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7) indicate that metals, VOCs, and SVOCs were detected in site media and BTEX compounds were detected in groundwater. To evaluate whether the detected constituents pose an unacceptable risk to human health and the environment, the analytical results were compared to human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed as part of human health and ecological risk evaluations for investigations performed under the BRAC Environmental Restoration Program at FTMC. Metals results exceeding the SSSLs and ESVs were subsequently compared to metals background screening values to determine if the metals concentrations are within natural background concentrations (SAIC, 1998). Site metals were further evaluated using statistical and geochemical methods to determine if the metals detected in site media are present at naturally occurring levels (Appendix J).

The following sections and Tables 5-1 through 5-5 summarize the results of the comparison of detected constituent concentrations to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix H.

5.1 Surface and Depositional Soil Analytical Results

Six surface soil samples and one depositional soil sample were collected for chemical analysis during the Phase I investigation at Parcels 146(7), 212(7), 24(7), 25(7), and 73(7). Surface soil samples were collected from the uppermost foot of soil and depositional soil samples were collected from the upper six inches of soil at the locations shown on Figure 3-1. The depositional soil sample from FTA-146-DEP01 and the surface soil sample from FTA-146-GP06 were collected from unpaved areas. The remaining surface soil samples were collected beneath asphalt-paved areas after the pavement had been removed. Analytical results were compared to residential human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-1. Figure 5-1 shows the soil sample locations with results exceeding background screening values and SSSLs.

Metals. A total of 18 metals were detected in the surface and depositional soil samples. The concentrations of five metals (aluminum, arsenic, chromium, iron, and manganese) exceeded their respective SSSLs. Of these, four metals results (arsenic, chromium, iron, and manganese) also exceeded their respective background values in one or more samples:

Table 5-1

Surface and Depositional Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location Sample Number Sample Date Sample Depth (Feet)					FTA-146-DEP01 CP0024 9-Nov-98 0- 1					FTA-146-GP05 CP0005 6-Oct-98 0- 1					FTA-146-GP06 CP0007 6-Oct-98 0- 1					FTA-146-GP07 CP0011 6-Oct-98 0- 1				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																								
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	6.53E+03				YES	9.74E+03			YES	YES	8.86E+03			YES	YES	7.69E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	1.05E+01			YES	YES	9.90E+00			YES		1.05E+01			YES	YES	1.38E+01		YES	YES	YES
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	8.19E+01					7.07E+01					6.82E+01					3.81E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					1.00E+00		YES			7.10E-01					5.80E-01				
Cadmium	mg/kg	2.90E-01	6.25E+00	1.60E+00	3.30E+00		YES		YES	ND					ND					ND				
Calcium	mg/kg	1.72E+03	NA	NA	1.10E+04	J	YES			2.20E+03		YES			1.68E+04		YES			3.27E+04		YES		
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	2.19E+01				YES	3.47E+01	J		YES	YES	3.09E+01	J		YES	YES	4.00E+01	J	YES	YES	YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	1.25E+01					6.14E+01		YES		YES	1.11E+01					6.20E+00				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	4.12E+01		YES		YES	3.09E+01	J	YES			2.65E+01	J	YES			2.39E+01	J	YES		
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	3.02E+04			YES	YES	3.74E+04		YES	YES	YES	3.18E+04			YES	YES	3.57E+04		YES	YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.35E+02		YES		YES	2.02E+01					2.04E+01					1.15E+01				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	5.18E+03		YES			ND					1.47E+03		YES			5.73E+03		YES		
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	2.16E+03		YES	YES	YES	2.58E+02				YES	3.99E+02			YES	YES	1.38E+02				YES
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	4.90E-02					ND					ND					ND				
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	7.00E+00					2.25E+01		YES			9.60E+00					1.34E+01		YES		
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	1.10E+00		YES		YES	1.70E+00		YES		YES	1.20E+00		YES		YES	1.50E+00		YES		YES
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.19E+01				YES	1.24E+01	J			YES	1.94E+01	J			YES	2.33E+01	J			YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	1.93E+02		YES		YES	6.18E+02	J	YES		YES	4.73E+01	J	YES			3.64E+01	J			
VOLATILE ORGANIC COMPOUNDS																								
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	ND					ND					ND					ND				
1,2-Dimethylbenzene	mg/kg	NA	1.55E+04	5.00E-02	ND					ND					ND					ND				
1,3,5-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	ND					ND					ND					ND				
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	1.20E-02	B				4.90E-03	B				5.50E-03	B				ND				
4-Methyl-2-pentanone	mg/kg	NA	6.21E+02	4.43E+02	ND					ND					ND					ND				
Acetone	mg/kg	NA	7.76E+02	2.50E+00	1.30E-01	J				7.90E-02	B				1.20E-01	B				2.10E-02	B			
Bromomethane	mg/kg	NA	1.09E+01	NA	2.60E-03	J				ND					ND					ND				
Ethylbenzene	mg/kg	NA	7.77E+02	5.00E-02	ND					ND					ND					ND				
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	5.10E-03	B				2.30E-03	B				3.20E-03	B				4.00E-03	B			
N-Propylbenzene	mg/kg	NA	7.77E+01	NA	ND					ND					ND					ND				
Toluene	mg/kg	NA	1.55E+03	5.00E-02	ND					ND					ND					ND				
m,p-Xylenes	mg/kg	NA	1.55E+04	5.00E-02	ND					ND					ND					ND				
o-Chlorotoluene	mg/kg	NA	1.55E+02	1.00E-01	ND					ND					ND					ND				
p-Chlorotoluene	mg/kg	NA	1.55E+02	1.00E-01	ND					ND					ND					ND				

Table 5-1

Surface and Depositional Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location					FTA-146-DEP01					FTA-146-GP05					FTA-146-GP06					FTA-146-GP07				
Sample Number					CP0024					CP0005					CP0007					CP0011				
Sample Date					9-Nov-98					6-Oct-98					6-Oct-98					6-Oct-98				
Sample Depth (Feet)					0- 1					0- 1					0- 1					0- 1				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
SEMIVOLATILE ORGANIC COMPOUNDS																								
Anthracene	mg/kg	9.35E-01	2.33E+03	1.00E-01	ND					3.50E-02	J				3.80E-02	J				ND				
Benzo(a)anthracene	mg/kg	1.19E+00	8.51E-01	5.21E+00	ND					1.20E-01	J				1.10E-01	J				ND				
Benzo(a)pyrene	mg/kg	1.42E+00	8.51E-02	1.00E-01	4.30E-02	J				1.20E-01	J		YES	YES	1.30E-01	J		YES	YES	ND				
Benzo(b)fluoranthene	mg/kg	1.66E+00	8.51E-01	5.98E+01	6.20E-02	J				1.20E-01	J				1.50E-01	J				ND				
Benzo(ghi)perylene	mg/kg	9.55E-01	2.32E+02	1.19E+02	ND					6.90E-02	J				5.40E-02	J				ND				
Benzo(k)fluoranthene	mg/kg	1.45E+00	8.51E+00	1.48E+02	6.10E-02	J				1.30E-01	J				1.60E-01	J				ND				
Bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	1.20E-01	J				ND					5.00E-02	B				ND				
Chrysene	mg/kg	1.40E+00	8.61E+01	4.73E+00	5.60E-02	J				1.30E-01	J				1.30E-01	J				ND				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	9.20E-02	J				ND					ND					ND				
Dibenz(a,h)anthracene	mg/kg	7.20E-01	8.61E-02	1.84E+01	ND					3.70E-02	J				ND					ND				
Fluoranthene	mg/kg	2.03E+00	3.09E+02	1.00E-01	7.00E-02	J				2.30E-01	J			YES	2.40E-01	J			YES	ND				
Indeno(1,2,3-cd)pyrene	mg/kg	9.37E-01	8.51E-01	1.09E+02	ND					6.60E-02	J				6.00E-02	J				ND				
Phenanthrene	mg/kg	1.08E+00	2.32E+03	1.00E-01	ND					1.10E-01	J			YES	1.10E-01	J			YES	ND				
Pyrene	mg/kg	1.63E+00	2.33E+02	1.00E-01	5.80E-02	J				1.90E-01	J			YES	1.90E-01	J			YES	ND				

Table 5-1

Surface and Depositional Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location / Sample Number / Sample Date / Sample Depth (Feet)					FTA-146-GP08 / CP0013 / 6-Oct-98 / 0- 1					FTA-146-GP09 / CP0015 / 6-Oct-98 / 0- 1					FTA-146-GP10 / CP0019 / 6-Oct-98 / 0- 1				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
METALS																			
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	6.77E+03				YES	3.77E+03				YES	5.12E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	1.42E+01		YES	YES	YES	8.60E+00			YES		8.00E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	4.32E+01					ND					3.27E+01				
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	ND					ND					ND				
Cadmium	mg/kg	2.90E-01	6.25E+00	1.60E+00	ND					ND					ND				
Calcium	mg/kg	1.72E+03	NA	NA	4.56E+04		YES			5.03E+04		YES			5.96E+04		YES		
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	2.71E+01	J		YES	YES	1.78E+01	J			YES	1.91E+01	J			YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	ND					ND					ND				
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	1.17E+01	J				6.20E+00	J				7.50E+00	J			
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	2.71E+04			YES	YES	1.37E+04			YES	YES	1.57E+04			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	7.30E+00					5.40E+00					4.50E+00				
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	3.33E+03		YES			5.79E+03		YES			1.60E+04		YES		
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	4.70E+01					5.74E+01					7.82E+01				
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	ND					ND					ND				
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	7.20E+00					ND					6.40E+00				
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	7.30E-01		YES			ND					ND				
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	2.62E+01	J			YES	2.25E+01	J			YES	2.13E+01	J			YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	2.06E+01	J				1.23E+01	B				1.58E+01	B			
VOLATILE ORGANIC COMPOUNDS																			
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	ND					5.10E-03	J				1.50E-01	J			YES
1,2-Dimethylbenzene	mg/kg	NA	1.55E+04	5.00E-02	ND					2.00E-03	J				7.70E-02				YES
1,3,5-Trimethylbenzene	mg/kg	NA	3.88E+02	1.00E-01	ND					ND					4.10E-02	J			
2-Butanone	mg/kg	NA	4.66E+03	8.96E+01	ND					ND					3.50E-03	B			
4-Methyl-2-pentanone	mg/kg	NA	6.21E+02	4.43E+02	ND					ND					5.50E-03	J			
Acetone	mg/kg	NA	7.76E+02	2.50E+00	1.40E-02	B				3.20E-02	B				3.80E-02	B			
Bromomethane	mg/kg	NA	1.09E+01	NA	ND					ND					ND				
Ethylbenzene	mg/kg	NA	7.77E+02	5.00E-02	ND					ND					6.90E-02				YES
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	2.00E-03	B				6.10E-03	B				6.20E-03	B			
N-Propylbenzene	mg/kg	NA	7.77E+01	NA	ND					ND					1.60E-02	J			
Toluene	mg/kg	NA	1.55E+03	5.00E-02	ND					4.30E-03	J				8.20E-02				YES
m,p-Xylenes	mg/kg	NA	1.55E+04	5.00E-02	ND					5.70E-03					2.70E-01				YES
o-Chlorotoluene	mg/kg	NA	1.55E+02	1.00E-01	ND					ND					2.20E-02	J			
p-Chlorotoluene	mg/kg	NA	1.55E+02	1.00E-01	ND					ND					4.40E-03	J			

Table 5-1

Surface and Depositional Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

(Page 4 of 4)

Sample Location Sample Number Sample Date Sample Depth (Feet)					FTA-146-GP08 CP0013 6-Oct-98 0- 1					FTA-146-GP09 CP0015 6-Oct-98 0- 1					FTA-146-GP10 CP0019 6-Oct-98 0- 1				
Parameter	Units	BKG[a]	SSSL[b]	ESV[b]	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV	Result	Qual	>BKG	>SSSL	>ESV
SEMIVOLATILE ORGANIC COMPOUNDS																			
Anthracene	mg/kg	9.35E-01	2.33E+03	1.00E-01	ND					ND					ND				
Benzo(a)anthracene	mg/kg	1.19E+00	8.51E-01	5.21E+00	ND					ND					ND				
Benzo(a)pyrene	mg/kg	1.42E+00	8.51E-02	1.00E-01	ND					4.00E-01	J		YES	YES	ND				
Benzo(b)fluoranthene	mg/kg	1.66E+00	8.51E-01	5.98E+01	ND					5.50E-01	J				ND				
Benzo(ghi)perylene	mg/kg	9.55E-01	2.32E+02	1.19E+02	ND					ND					ND				
Benzo(k)fluoranthene	mg/kg	1.45E+00	8.51E+00	1.48E+02	ND					ND					ND				
Bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	ND					ND					ND				
Chrysene	mg/kg	1.40E+00	8.61E+01	4.73E+00	ND					ND					ND				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	ND					ND					ND				
Dibenz(a,h)anthracene	mg/kg	7.20E-01	8.61E-02	1.84E+01	ND					ND					ND				
Fluoranthene	mg/kg	2.03E+00	3.09E+02	1.00E-01	4.50E-01	J			YES	ND					ND				
Indeno(1,2,3-cd)pyrene	mg/kg	9.37E-01	8.51E-01	1.09E+02	ND					ND					ND				
Phenanthrene	mg/kg	1.08E+00	2.32E+03	1.00E-01	ND					ND					ND				
Pyrene	mg/kg	1.63E+00	2.33E+02	1.00E-01	3.40E-01	J			YES	4.50E-01	J			YES	ND				

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama* , July.

[b] Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County , Alabama,* July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-2

Subsurface Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

(Page 1 of 6)

Sample Location				FTA-146-GP01				FTA-146-GP02				FTA-146-GP03				FTA-146-GP04				FTA-146-GP05			
Sample Number				CP0001				CP0002				CP0003				CP0004				CP0006			
Sample Date				7-Oct-98				7-Oct-98				7-Oct-98				7-Oct-98				6-Oct-98			
Sample Depth (Feet)				8 - 11.5				4 - 8				1 - 4				4 - 8				5 - 9			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																							
Aluminum	mg/kg	1.36E+04	7.80E+03	1.22E+04			YES	1.23E+04			YES	1.19E+04			YES	1.16E+04			YES	1.23E+04			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	9.00E+00			YES	1.46E+01			YES	7.70E+00			YES	1.02E+01			YES	1.14E+01			YES
Barium	mg/kg	2.34E+02	5.47E+02	4.71E+01				6.58E+01				4.06E+01				5.42E+01				7.99E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	8.10E-01				1.60E+00		YES		7.60E-01				1.00E+00		YES		7.70E-01			
Cadmium	mg/kg	2.20E-01	6.25E+00	ND				ND				ND				ND				ND			
Calcium	mg/kg	6.37E+02	NA	ND				ND				6.50E+02		YES		1.15E+03		YES		ND			
Chromium	mg/kg	3.83E+01	2.32E+01	2.21E+01	J			1.37E+01	J			2.31E+01	J			2.53E+01	J		YES	2.77E+01	J		YES
Cobalt	mg/kg	1.75E+01	4.68E+02	ND				3.32E+01		YES		1.02E+01				2.09E+01		YES		6.70E+00			
Copper	mg/kg	1.94E+01	3.13E+02	6.76E+01	J	YES		7.35E+01	J	YES		1.61E+01	J			2.37E+01	J	YES		4.55E+01	J	YES	
Iron	mg/kg	4.48E+04	2.34E+03	3.00E+04			YES	4.11E+04			YES	3.03E+04			YES	3.70E+04			YES	4.65E+04		YES	YES
Lead	mg/kg	3.85E+01	4.00E+02	2.22E+01				4.35E+01		YES		1.98E+01				2.26E+01				1.92E+01			
Magnesium	mg/kg	7.66E+02	NA	ND				ND				5.69E+02				ND				ND			
Manganese	mg/kg	1.36E+03	3.63E+02	2.90E+00				6.49E+02			YES	2.14E+02				2.93E+02				3.39E+01			
Mercury	mg/kg	7.00E-02	2.33E+00	ND				4.80E-02				ND				ND				ND			
Nickel	mg/kg	1.29E+01	1.54E+02	ND				3.03E+01		YES		8.80E+00				1.48E+01		YES		6.70E+00			
Potassium	mg/kg	7.11E+02	NA	8.50E+02		YES		6.30E+02				ND				ND				7.38E+02		YES	
Selenium	mg/kg	4.70E-01	3.91E+01	2.20E+00		YES		2.00E+00		YES		1.50E+00		YES		1.90E+00		YES		2.90E+00		YES	
Vanadium	mg/kg	6.49E+01	5.31E+01	2.93E+01	J			2.12E+01	J			1.56E+01	J			1.95E+01	J			2.16E+01	J		
Zinc	mg/kg	3.49E+01	2.34E+03	5.57E+01	J	YES		1.06E+02	J	YES		3.49E+01	J	YES		5.27E+01	J	YES		6.63E+01	J	YES	
VOLATILE ORGANIC COMPOUNDS																							
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	ND				ND				ND				ND				ND			
1,2-Dimethylbenzene	mg/kg	NA	1.55E+04	1.10E-02	J			ND				ND				ND				ND			
1,3,5-Trimethylbenzene	mg/kg	NA	3.88E+02	6.20E-03				ND				ND				ND				ND			
2-Butanone	mg/kg	NA	4.66E+03	ND				5.50E-01				9.40E-03	B			3.20E-03	B			ND			
Acetone	mg/kg	NA	7.76E+02	ND				3.20E-01	J			7.50E-02	B			6.70E-02	B			9.60E-03	B		
Benzene	mg/kg	NA	2.17E+01	ND				ND				ND				ND				ND			
Carbon tetrachloride	mg/kg	NA	4.83E+00	ND				3.00E-03	J			ND				ND				ND			
Chloroform	mg/kg	NA	1.03E+02	ND				1.90E-03	J			ND				ND				ND			
Cumene	mg/kg	NA	7.77E+02	ND				ND				ND				ND				ND			
Ethylbenzene	mg/kg	NA	7.77E+02	ND				ND				ND				ND				ND			
Methylene chloride	mg/kg	NA	8.41E+01	2.90E-03	B			2.50E-03	B			2.40E-03	B			2.80E-03	B			4.30E-03	B		
N-Butylbenzene	mg/kg	NA	7.77E+01	ND				ND				ND				ND				ND			
N-Propylbenzene	mg/kg	NA	7.77E+01	ND				ND				ND				ND				ND			
Naphthalene	mg/kg	NA	1.55E+02	2.50E-03	J			ND				ND				ND				ND			
Toluene	mg/kg	NA	1.55E+03	ND				3.00E-03	J			ND				ND				ND			
Trichlorofluoromethane	mg/kg	NA	2.33E+03	ND				ND				ND				ND				ND			
m,p-Xylenes	mg/kg	NA	1.55E+04	ND				ND				ND				ND				ND			
o-Chlorotoluene	mg/kg	NA	1.55E+02	ND				ND				ND				ND				ND			
p-Cymene	mg/kg	NA	1.55E+03	ND				2.30E-02				ND				ND				ND			
sec-Butylbenzene	mg/kg	NA	7.77E+01	ND				ND				ND				ND				ND			

Table 5-2

Subsurface Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location				FTA-146-GP01				FTA-146-GP02				FTA-146-GP03				FTA-146-GP04				FTA-146-GP05			
Sample Number				CP0001				CP0002				CP0003				CP0004				CP0006			
Sample Date				7-Oct-98				7-Oct-98				7-Oct-98				7-Oct-98				6-Oct-98			
Sample Depth (Feet)				8 - 11.5				4 - 8				1 - 4				4 - 8				5 - 9			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
SEMIVOLATILE ORGANIC COMPOUNDS																							
2-Methylnaphthalene	mg/kg	NA	1.55E+02	ND				ND				ND				ND				ND			
Acenaphthene	mg/kg	NA	4.63E+02	ND				ND				ND				ND				ND			
Anthracene	mg/kg	NA	2.33E+03	ND				ND				ND				ND				ND			
Benzo(a)anthracene	mg/kg	NA	8.51E-01	5.30E-02	J			ND				4.70E-02	J			4.70E-02	J			ND			
Benzo(a)pyrene	mg/kg	NA	8.51E-02	ND				ND				4.50E-02	J			4.80E-02	J			ND			
Benzo(b)fluoranthene	mg/kg	NA	8.51E-01	3.90E-02	J			ND				5.60E-02	J			4.90E-02	J			ND			
Benzo(ghi)perylene	mg/kg	NA	2.32E+02	ND				ND				ND				ND				ND			
Benzo(k)fluoranthene	mg/kg	NA	8.51E+00	ND				ND				4.90E-02	J			5.30E-02	J			ND			
Bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	ND				ND				ND				ND				5.70E-02	B		
Chrysene	mg/kg	NA	8.61E+01	7.20E-02	J			ND				5.70E-02	J			6.10E-02	J			ND			
Dibenz(a,h)anthracene	mg/kg	NA	8.61E-02	ND				ND				ND				ND				ND			
Dibenzofuran	mg/kg	NA	3.09E+01	ND				ND				ND				ND				ND			
Fluoranthene	mg/kg	NA	3.09E+02	2.10E-01	J			ND				9.40E-02	J			8.70E-02	J			ND			
Fluorene	mg/kg	NA	3.09E+02	ND				ND				ND				ND				ND			
Indeno(1,2,3-cd)pyrene	mg/kg	NA	8.51E-01	ND				ND				ND				ND				ND			
Phenanthrene	mg/kg	NA	2.32E+03	1.90E-01	J			ND				ND				ND				ND			
Pyrene	mg/kg	NA	2.33E+02	1.60E-01	J			ND				8.30E-02	J			7.90E-02	J			ND			

Table 5-2

Subsurface Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location / Sample Number / Sample Date / Sample Depth (Feet)				FTA-146-GP06 CP0010 6-Oct-98 9 - 13				FTA-146-GP07 CP0012 6-Oct-98 1 - 5				FTA-146-GP08 CP0014 6-Oct-98 5 - 9				FTA-146-GP09 CP0016 6-Oct-98 9 - 13			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.19E+04			YES	8.49E+03			YES	1.71E+04		YES	YES	8.81E+03			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	9.20E+00			YES	1.83E+01		YES	YES	2.54E+01		YES	YES	2.21E+01		YES	YES
Barium	mg/kg	2.34E+02	5.47E+02	4.79E+01				5.00E+01				3.36E+01				7.19E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	1.50E+00		YES		1.60E+00		YES		2.00E+00		YES		9.40E+00		YES	
Cadmium	mg/kg	2.20E-01	6.25E+00	ND				ND				ND				2.30E+00		YES	
Calcium	mg/kg	6.37E+02	NA	ND				5.96E+02				ND				ND			
Chromium	mg/kg	3.83E+01	2.32E+01	2.08E+01	J			5.40E+01	J	YES	YES	3.00E+01	J		YES	1.41E+01	J		
Cobalt	mg/kg	1.75E+01	4.68E+02	1.83E+01		YES		2.91E+01		YES		ND				2.25E+02		YES	
Copper	mg/kg	1.94E+01	3.13E+02	3.94E+01	J	YES		3.04E+01	J	YES		5.74E+01	J	YES		5.47E+01	J	YES	
Iron	mg/kg	4.48E+04	2.34E+03	4.01E+04			YES	7.97E+04		YES	YES	9.00E+04		YES	YES	6.60E+04		YES	YES
Lead	mg/kg	3.85E+01	4.00E+02	3.50E+01				1.93E+01				3.31E+01				3.72E+01			
Magnesium	mg/kg	7.66E+02	NA	ND				ND				ND				6.61E+02			
Manganese	mg/kg	1.36E+03	3.63E+02	1.15E+03			YES	5.84E+02			YES	1.47E+02				1.63E+03		YES	YES
Mercury	mg/kg	7.00E-02	2.33E+00	ND				ND				6.60E-02				5.50E-02			
Nickel	mg/kg	1.29E+01	1.54E+02	8.80E+00				4.35E+01		YES		4.04E+01		YES		3.12E+02		YES	YES
Potassium	mg/kg	7.11E+02	NA	7.22E+02		YES		ND				ND				ND			
Selenium	mg/kg	4.70E-01	3.91E+01	2.20E+00		YES		2.50E+00		YES		2.10E+00		YES		1.20E+00		YES	
Vanadium	mg/kg	6.49E+01	5.31E+01	1.75E+01	J			ND				ND				ND			
Zinc	mg/kg	3.49E+01	2.34E+03	4.88E+01	J	YES		3.95E+02	J	YES		1.11E+02	J	YES		6.51E+02	J	YES	
VOLATILE ORGANIC COMPOUNDS																			
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	ND				ND				4.00E-02				ND			
1,2-Dimethylbenzene	mg/kg	NA	1.55E+04	ND				ND				1.00E-01				ND			
1,3,5-Trimethylbenzene	mg/kg	NA	3.88E+02	ND				ND				1.40E-02				ND			
2-Butanone	mg/kg	NA	4.66E+03	3.80E-03	B			ND				ND				ND			
Acetone	mg/kg	NA	7.76E+02	5.80E-02	B			3.40E-02	B			ND				1.10E-02	B		
Benzene	mg/kg	NA	2.17E+01	ND				ND				3.00E-01				ND			
Carbon tetrachloride	mg/kg	NA	4.83E+00	ND				ND				ND				ND			
Chloroform	mg/kg	NA	1.03E+02	ND				ND				ND				ND			
Cumene	mg/kg	NA	7.77E+02	ND				ND				ND				ND			
Ethylbenzene	mg/kg	NA	7.77E+02	ND				ND				4.00E-02				ND			
Methylene chloride	mg/kg	NA	8.41E+01	3.30E-03	B			3.40E-03	B			4.50E-03	B			3.80E-03	B		
N-Butylbenzene	mg/kg	NA	7.77E+01	ND				ND				ND				ND			
N-Propylbenzene	mg/kg	NA	7.77E+01	ND				ND				3.60E-03	J			ND			
Naphthalene	mg/kg	NA	1.55E+02	ND				ND				1.70E-02	J			ND			
Toluene	mg/kg	NA	1.55E+03	ND				ND				8.80E-03				ND			
Trichlorofluoromethane	mg/kg	NA	2.33E+03	ND				ND				ND				ND			
m,p-Xylenes	mg/kg	NA	1.55E+04	ND				ND				4.30E-02				ND			
o-Chlorotoluene	mg/kg	NA	1.55E+02	ND				ND				2.50E-03	J			ND			
p-Cymene	mg/kg	NA	1.55E+03	ND				ND				ND				ND			
sec-Butylbenzene	mg/kg	NA	7.77E+01	ND				ND				ND				ND			

Table 5-2

Subsurface Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location				FTA-146-GP06				FTA-146-GP07				FTA-146-GP08				FTA-146-GP09			
Sample Number				CP0010				CP0012				CP0014				CP0016			
Sample Date				6-Oct-98				6-Oct-98				6-Oct-98				6-Oct-98			
Sample Depth (Feet)				9 - 13				1 - 5				5 - 9				9 - 13			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
SEMIVOLATILE ORGANIC COMPOUNDS																			
2-Methylnaphthalene	mg/kg	NA	1.55E+02	ND				ND				ND				ND			
Acenaphthene	mg/kg	NA	4.63E+02	ND				ND				ND				ND			
Anthracene	mg/kg	NA	2.33E+03	ND				ND				ND				ND			
Benzo(a)anthracene	mg/kg	NA	8.51E-01	ND				ND				ND				ND			
Benzo(a)pyrene	mg/kg	NA	8.51E-02	ND				ND				ND				ND			
Benzo(b)fluoranthene	mg/kg	NA	8.51E-01	ND				ND				ND				ND			
Benzo(ghi)perylene	mg/kg	NA	2.32E+02	ND				ND				ND				ND			
Benzo(k)fluoranthene	mg/kg	NA	8.51E+00	ND				ND				ND				ND			
Bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	ND				ND				5.40E-02	B			5.20E-02	B		
Chrysene	mg/kg	NA	8.61E+01	ND				ND				ND				ND			
Dibenz(a,h)anthracene	mg/kg	NA	8.61E-02	ND				ND				ND				ND			
Dibenzofuran	mg/kg	NA	3.09E+01	ND				ND				ND				ND			
Fluoranthene	mg/kg	NA	3.09E+02	ND				4.40E-02	J			ND				ND			
Fluorene	mg/kg	NA	3.09E+02	ND				ND				ND				ND			
Indeno(1,2,3-cd)pyrene	mg/kg	NA	8.51E-01	ND				ND				ND				ND			
Phenanthrene	mg/kg	NA	2.32E+03	ND				ND				ND				ND			
Pyrene	mg/kg	NA	2.33E+02	ND				3.60E-02	J			ND				ND			

Table 5-2

Subsurface Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location				FTA-146-GP10				FTA-146-GP11				FTA-146-GP12				FTA-146-GP13			
Sample Number				CP0020				CP0021				CP0022				CP0023			
Sample Date				6-Oct-98				7-Oct-98				7-Oct-98				7-Oct-98			
Sample Depth (Feet)				9 - 13				4 - 8				8 - 12				1 - 4			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	1.16E+04			YES	1.40E+04		YES	YES	8.99E+03			YES	1.34E+04			YES
Arsenic	mg/kg	1.83E+01	4.26E-01	1.35E+01			YES	6.30E+00			YES	8.90E+00			YES	7.20E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	4.13E+01				5.65E+01				4.39E+01				3.82E+01			
Beryllium	mg/kg	8.60E-01	9.60E+00	6.00E-01				ND				ND				1.50E+00		YES	
Cadmium	mg/kg	2.20E-01	6.25E+00	ND				ND				ND				ND			
Calcium	mg/kg	6.37E+02	NA	ND				ND				ND				ND			
Chromium	mg/kg	3.83E+01	2.32E+01	2.49E+01	J		YES	1.74E+01	J			1.84E+01	J			2.54E+01	J		YES
Cobalt	mg/kg	1.75E+01	4.68E+02	ND				ND				ND				9.40E+00			
Copper	mg/kg	1.94E+01	3.13E+02	1.11E+02	J	YES		4.79E+01	J	YES		6.18E+01	J	YES		5.24E+01	J	YES	
Iron	mg/kg	4.48E+04	2.34E+03	5.00E+04		YES	YES	2.02E+04			YES	1.78E+04			YES	4.47E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	2.17E+01				1.67E+01				1.60E+01				2.50E+01			
Magnesium	mg/kg	7.66E+02	NA	ND				ND				ND				ND			
Manganese	mg/kg	1.36E+03	3.63E+02	1.02E+01				6.70E+00				ND				6.89E+01			
Mercury	mg/kg	7.00E-02	2.33E+00	ND				ND				ND				ND			
Nickel	mg/kg	1.29E+01	1.54E+02	ND				ND				ND				1.36E+01		YES	
Potassium	mg/kg	7.11E+02	NA	6.49E+02				7.41E+02		YES		8.22E+02		YES		7.73E+02		YES	
Selenium	mg/kg	4.70E-01	3.91E+01	3.00E+00		YES		1.90E+00		YES		3.80E+00		YES		3.70E+00		YES	
Vanadium	mg/kg	6.49E+01	5.31E+01	1.10E+01	J			1.49E+01	J			2.43E+01	J			9.80E+00	J		
Zinc	mg/kg	3.49E+01	2.34E+03	3.84E+01	J	YES		1.24E+01	B			1.66E+01	J			4.41E+01	J	YES	
VOLATILE ORGANIC COMPOUNDS																			
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	ND				ND				5.40E-01				4.60E-03	J		
1,2-Dimethylbenzene	mg/kg	NA	1.55E+04	ND				ND				6.40E-02	J			ND			
1,3,5-Trimethylbenzene	mg/kg	NA	3.88E+02	ND				ND				3.20E-01				ND			
2-Butanone	mg/kg	NA	4.66E+03	ND				ND				ND				ND			
Acetone	mg/kg	NA	7.76E+02	ND				7.20E-03	B			ND				1.60E-02	B		
Benzene	mg/kg	NA	2.17E+01	ND				ND				ND				ND			
Carbon tetrachloride	mg/kg	NA	4.83E+00	ND				ND				ND				ND			
Chloroform	mg/kg	NA	1.03E+02	ND				ND				ND				ND			
Cumene	mg/kg	NA	7.77E+02	ND				ND				5.10E-02	J			ND			
Ethylbenzene	mg/kg	NA	7.77E+02	ND				ND				3.00E-02	J			ND			
Methylene chloride	mg/kg	NA	8.41E+01	5.10E-03	B			2.70E-03	B			3.20E-03	B			3.00E-03	B		
N-Butylbenzene	mg/kg	NA	7.77E+01	ND				ND				5.90E-01				4.00E-03	J		
N-Propylbenzene	mg/kg	NA	7.77E+01	ND				ND				2.50E-01	J			ND			
Naphthalene	mg/kg	NA	1.55E+02	ND				ND				3.80E-02	J			ND			
Toluene	mg/kg	NA	1.55E+03	ND				ND				ND				ND			
Trichlorofluoromethane	mg/kg	NA	2.33E+03	3.90E-03	J			ND				ND				ND			
m,p-Xylenes	mg/kg	NA	1.55E+04	ND				ND				1.10E-01	J			ND			
o-Chlorotoluene	mg/kg	NA	1.55E+02	ND				ND				ND				ND			
p-Cymene	mg/kg	NA	1.55E+03	ND				ND				6.40E-02	J			ND			
sec-Butylbenzene	mg/kg	NA	7.77E+01	ND				ND				1.00E-01	J			ND			

Table 5-2

Subsurface Soil Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location Sample Number Sample Date Sample Depth (Feet)				FTA-146-GP10 CP0020 6-Oct-98 9 - 13				FTA-146-GP11 CP0021 7-Oct-98 4 - 8				FTA-146-GP12 CP0022 7-Oct-98 8 - 12				FTA-146-GP13 CP0023 7-Oct-98 1 - 4			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
SEMIVOLATILE ORGANIC COMPOUNDS																			
2-Methylnaphthalene	mg/kg	NA	1.55E+02	ND				ND				2.00E-01	J			ND			
Acenaphthene	mg/kg	NA	4.63E+02	ND				ND				4.80E-02	J			ND			
Anthracene	mg/kg	NA	2.33E+03	ND				ND				5.30E-02	J			ND			
Benzo(a)anthracene	mg/kg	NA	8.51E-01	ND				ND				5.70E-01				3.90E-02	J		
Benzo(a)pyrene	mg/kg	NA	8.51E-02	ND				ND				8.60E-02	J		YES	4.00E-02	J		
Benzo(b)fluoranthene	mg/kg	NA	8.51E-01	ND				ND				3.50E-01	J			4.10E-02	J		
Benzo(ghi)perylene	mg/kg	NA	2.32E+02	ND				ND				9.20E-02	J			4.00E-02	J		
Benzo(k)fluoranthene	mg/kg	NA	8.51E+00	ND				ND				4.10E-01				ND			
Bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	ND				5.20E-02	J			ND				4.70E-02	J		
Chrysene	mg/kg	NA	8.61E+01	ND				ND				5.60E-01				4.40E-02	J		
Dibenz(a,h)anthracene	mg/kg	NA	8.61E-02	ND				ND				6.70E-02	J			ND			
Dibenzofuran	mg/kg	NA	3.09E+01	ND				ND				4.70E-02	J			ND			
Fluoranthene	mg/kg	NA	3.09E+02	ND				ND				2.10E+00				6.50E-02	J		
Fluorene	mg/kg	NA	3.09E+02	ND				ND				1.30E-01	J			ND			
Indeno(1,2,3-cd)pyrene	mg/kg	NA	8.51E-01	ND				ND				1.10E-01	J			ND			
Phenanthrene	mg/kg	NA	2.32E+03	ND				ND				1.80E+00				ND			
Pyrene	mg/kg	NA	2.33E+02	ND				ND				1.50E+00				6.00E-02	J		

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama* , July.

[b] Residential human health site-specific screening level (SSSL) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama* , July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-3

Phase I Groundwater Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

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Sample Location Sample Number Sample Date				FTA-146-GP02 CP3002 15-Dec-98				FTA-146-GP05 CP3005 17-Dec-98				FTA-146-GP06 CP3006 8-Jan-99				FTA-146-GP07 CP3009 17-Dec-98			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS																			
Aluminum	mg/L	2.34E+00	1.56E+00	7.70E-02	J			1.71E+00			YES	1.04E+00				9.40E-02	J		
Barium	mg/L	1.27E-01	1.10E-01	2.36E-02	J			1.40E-01	J	YES	YES	1.63E-01	J	YES	YES	1.50E-01	J	YES	YES
Cadmium	mg/L	2.51E-03	7.82E-04	ND				ND				ND				ND			
Calcium	mg/L	5.65E+01	NA	2.04E+00	J			1.04E+01				6.92E+00				1.27E+01			
Chromium	mg/L	NA	4.69E-03	ND				ND				ND				ND			
Cobalt	mg/L	2.34E-02	9.39E-02	1.35E-02	J			ND				5.32E-02		YES		6.49E-02		YES	
Copper	mg/L	2.55E-02	6.26E-02	ND				ND				ND				ND			
Iron	mg/L	7.04E+00	4.69E-01	3.36E+00			YES	3.81E+00			YES	5.77E+00			YES	6.33E+00			YES
Magnesium	mg/L	2.13E+01	NA	1.09E+01				6.79E+00				8.37E+00				8.97E+00			
Manganese	mg/L	5.81E-01	7.35E-02	7.20E-02				1.42E-01			YES	1.75E+00		YES	YES	1.73E+00		YES	YES
Mercury	mg/L	NA	4.69E-04	5.40E-05	B			5.80E-05	B			5.70E-05	J			6.60E-05	B		
Nickel	mg/L	NA	3.13E-02	3.50E-02	J		YES	ND				1.72E-02	J			1.94E-02	J		
Potassium	mg/L	7.20E+00	NA	ND				2.71E+00	J			2.87E+00	B			1.32E+00	J		
Sodium	mg/L	1.48E+01	NA	1.30E+00	J			5.33E+00				4.94E+00	J			3.76E+00	J		
Thallium	mg/L	1.46E-03	1.02E-04	4.50E-03	B	YES	YES	ND				ND				4.70E-03	B	YES	YES
Vanadium	mg/L	1.70E-02	1.10E-02	ND				ND				ND				ND			
Zinc	mg/L	2.20E-01	4.69E-01	1.00E-01				1.51E-02	J			3.06E-02				3.96E-02			
VOLATILE ORGANIC COMPOUNDS																			
1,2,4-Trimethylbenzene	mg/L	NA	6.00E-03	2.50E-04	J			ND				ND				ND			
4-Methyl-2-pentanone	mg/L	NA	5.84E-02	8.80E-04	J			ND				ND				ND			
Acetone	mg/L	NA	1.56E-01	ND				1.60E-03	J			ND				ND			
Benzene	mg/L	NA	1.41E-03	2.80E-02			YES	ND				ND				ND			
Chloroform	mg/L	NA	1.15E-03	ND				ND				ND				ND			
Ethylbenzene	mg/L	NA	1.40E-01	1.90E-04	J			ND				ND				ND			
Hexachlorobutadiene	mg/L	NA	8.40E-04	ND				ND				ND				1.50E-04	B		
Toluene	mg/L	NA	2.59E-01	1.00E-04	J			ND				ND				ND			
SEMIVOLATILE ORGANIC COMPOUNDS																			
Di-n-butyl phthalate	mg/L	NA	1.48E-01	1.70E-03	J			3.70E-03	J			ND				1.20E-03	J		

Table 5-3

Phase I Groundwater Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location / Sample Number / Sample Date				FTA-146-GP08 / CP3010 / 16-Dec-98				FTA-146-GP09 / CP3011 / 16-Dec-98				FTA-146-GP10 / CP3012 / 16-Dec-98			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
METALS															
Aluminum	mg/L	2.34E+00	1.56E+00	1.19E+00				1.42E-01	J			1.05E+00			
Barium	mg/L	1.27E-01	1.10E-01	2.51E-02	J			3.66E-02	J			1.26E-01	J		YES
Cadmium	mg/L	2.51E-03	7.82E-04	ND				5.30E-03	B	YES	YES	ND			
Calcium	mg/L	5.65E+01	NA	3.57E+01				1.04E+01				7.77E-01	J		
Chromium	mg/L	NA	4.69E-03	5.00E-03	J		YES	ND				ND			
Cobalt	mg/L	2.34E-02	9.39E-02	ND				2.19E-02	J			1.20E-02	J		
Copper	mg/L	2.55E-02	6.26E-02	4.70E-03	J			ND				ND			
Iron	mg/L	7.04E+00	4.69E-01	1.84E+00			YES	5.24E-01			YES	3.61E+00			YES
Magnesium	mg/L	2.13E+01	NA	2.61E+00	J			3.55E+00	J			7.23E+00			
Manganese	mg/L	5.81E-01	7.35E-02	1.60E-01			YES	1.79E-01			YES	7.13E-02			
Mercury	mg/L	NA	4.69E-04	6.30E-05	B			7.80E-05	B			7.20E-05	B		
Nickel	mg/L	NA	3.13E-02	ND				3.19E-02	J		YES	3.22E-02	J		YES
Potassium	mg/L	7.20E+00	NA	ND				1.55E+00	J			1.04E+00	J		
Sodium	mg/L	1.48E+01	NA	8.43E-01	J			1.50E+00	J			2.08E+00	J		
Thallium	mg/L	1.46E-03	1.02E-04	ND				4.90E-03	B	YES	YES	5.00E-03	B	YES	YES
Vanadium	mg/L	1.70E-02	1.10E-02	7.40E-03	J			ND				ND			
Zinc	mg/L	2.20E-01	4.69E-01	1.03E-02	J			3.59E-02				9.64E-02			
VOLATILE ORGANIC COMPOUNDS															
1,2,4-Trimethylbenzene	mg/L	NA	6.00E-03	ND				ND				ND			
4-Methyl-2-pentanone	mg/L	NA	5.84E-02	ND				ND				ND			
Acetone	mg/L	NA	1.56E-01	1.10E-03	J			1.90E-03	J			ND			
Benzene	mg/L	NA	1.41E-03	ND				ND				ND			
Chloroform	mg/L	NA	1.15E-03	1.40E-04	B			ND				ND			
Ethylbenzene	mg/L	NA	1.40E-01	ND				ND				ND			
Hexachlorobutadiene	mg/L	NA	8.40E-04	ND				ND				ND			
Toluene	mg/L	NA	2.59E-01	ND				ND				ND			
SEMIVOLATILE ORGANIC COMPOUNDS															
Di-n-butyl phthalate	mg/L	NA	1.48E-01	3.00E-03	J			3.20E-03	J			4.00E-03	J		

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] Residential human health site-specific screening level (SSSL) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

J - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-4

Phase II Groundwater Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location Sample Number Sample Date				FTA-146-MW01 CPP3001 28-Feb-01				FTA-146-MW02 CPP3002 28-Feb-01				FTA-146-MW03 CPP3003 1-Mar-01				FTA-146-MW04 CPP3006 2-Mar-01				FTA-146-MW05 CPP3007 15-Feb-01			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
BTEX																							
Benzene	mg/L	NA	1.41E-03	1.10E-03				5.00E-02			YES	ND				ND				ND			
Ethylbenzene	mg/L	NA	1.40E-01	4.10E-04	J			1.70E-02				ND				ND				ND			
Toluene	mg/L	NA	2.59E-01	9.70E-04	J			7.10E-03				3.00E-04	J			ND				ND			
Xylene, Total	mg/L	NA	2.80E+00	3.70E-04	J			3.80E-02				ND				ND				ND			

Sample Location Sample Number Sample Date				FTA-146-MW06 CPP3008 28-Feb-01				FTA-146-MW07 CPP3009 2-Mar-01				FTA-146-MW08 CPP3010 2-Mar-01				FTA-146-MW09 CPP3011 1-Mar-01			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
BTEX																			
Benzene	mg/L	NA	1.41E-03	ND				ND				ND				ND			
Ethylbenzene	mg/L	NA	1.40E-01	ND				ND				ND				ND			
Toluene	mg/L	NA	2.59E-01	ND				3.40E-04	J			ND				ND			
Xylene, Total	mg/L	NA	2.80E+00	ND				ND				ND				ND			

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

[b] Residential human health site-specific screening level (SSSL) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

J - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-5

Phase III Groundwater Analytical Results
Former Motor Pool Area 3100, Parcels 146(7), 24(7), 25(7), and 212(7)
Fort McClellan, Calhoun County, Alabama

Sample Location Sample Number Sample Date				FTA-146-MW01 OCP3001 4-Oct-01				FTA-146-MW01 OCP3007 22-Jan-02				FTA-146-MW02 CPP3002R 17-Jul-01				FTA-146-MW02 OCP3002 4-Oct-01				FTA-146-MW02 OCP3008 22-Jan-02			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
BTEX																							
Benzene	mg/L	NA	1.41E-03	ND				ND				1.10E-01			YES	9.90E-02			YES	1.20E-01			YES
Ethylbenzene	mg/L	NA	1.40E-01	ND				ND				7.90E-02				8.70E-02				1.20E-01			
Toluene	mg/L	NA	2.59E-01	ND				ND				5.00E-02				4.90E-02				4.80E-02			
Xylene, Total	mg/L	NA	2.80E+00	ND				ND				1.70E-01				1.50E-01				2.00E-01			

Sample Location Sample Number Sample Date				FTA-146-MW03 OCP3003 5-Oct-01				FTA-146-MW03 OCP3009 24-Jan-02				FTA-146-MW04 OCP3004 16-Oct-01				FTA-146-MW04 OCP3010 25-Jan-02			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
BTEX																			
Benzene	mg/L	NA	1.41E-03	ND				ND				ND				ND			
Ethylbenzene	mg/L	NA	1.40E-01	4.10E-04	J			ND				ND				ND			
Toluene	mg/L	NA	2.59E-01	4.90E-04	B			ND				ND				ND			
Xylene, Total	mg/L	NA	2.80E+00	1.40E-03	J			ND				ND				ND			

Sample Location Sample Number Sample Date				FTA-146-MW05 OCP3005 10-Oct-01				FTA-146-MW05 OCP3011 24-Jan-02				FTA-146-MW09 OCP3006 11-Oct-01				FTA-146-MW09 OCP3012 23-Jan-02			
Parameter	Units	BKG[a]	SSSL[b]	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL	Result	Qual	>BKG	>SSSL
BTEX																			
Benzene	mg/L	NA	1.41E-03	ND				ND				ND				ND			
Ethylbenzene	mg/L	NA	1.40E-01	ND				ND				ND				ND			
Toluene	mg/L	NA	2.59E-01	ND				ND				ND				ND			
Xylene, Total	mg/L	NA	2.80E+00	ND				ND				ND				ND			

Analyses performed using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods.

[a] BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in SAIC, 1998, *Final Background Metals Survey Report, Fort McClellan, Alabama* , July.

[b] Residential human health site-specific screening level (SSSL) as given in IT, 2000, *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama* , July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit.

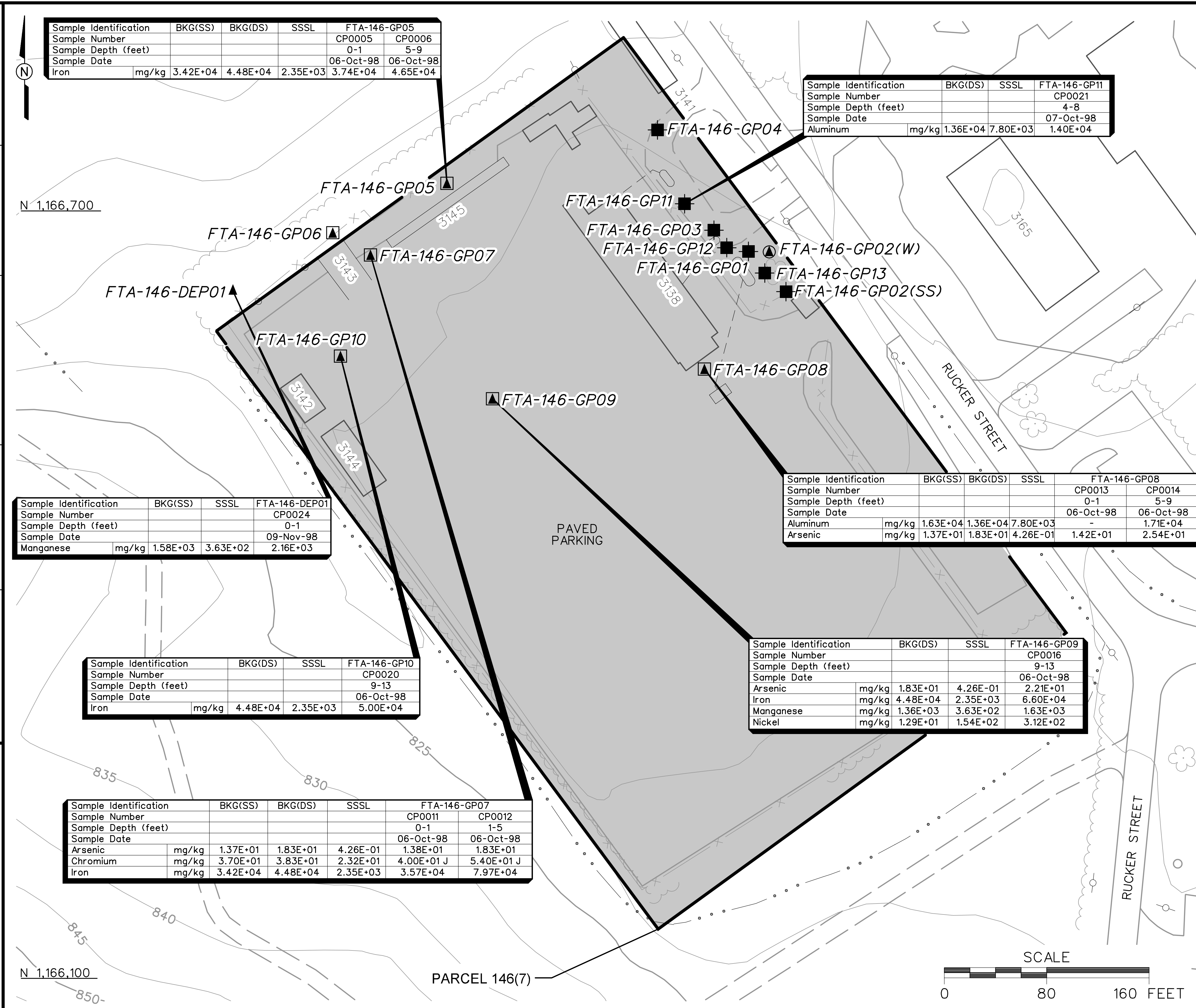
J - Compound was positively identified; reported value is an estimated concentration.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.



Sample Identification		BKG(SS)	BKG(DS)	SSSL	FTA-146-GP05	
Sample Number					CP0005	CP0006
Sample Depth (feet)					0-1	5-9
Sample Date					06-Oct-98	06-Oct-98
Iron	mg/kg	3.42E+04	4.48E+04	2.35E+03	3.74E+04	4.65E+04

Sample Identification		BKG(DS)	SSSL	FTA-146-GP11
Sample Number				CP0021
Sample Depth (feet)				4-8
Sample Date				07-Oct-98
Aluminum	mg/kg	1.36E+04	7.80E+03	1.40E+04

Sample Identification		BKG(SS)	BKG(DS)	SSSL	FTA-146-GP08	
Sample Number					CP0013	CP0014
Sample Depth (feet)					0-1	5-9
Sample Date					06-Oct-98	06-Oct-98
Aluminum	mg/kg	1.63E+04	1.36E+04	7.80E+03	–	1.71E+04
Arsenic	mg/kg	1.37E+01	1.83E+01	4.26E-01	1.42E+01	2.54E+01

Sample Identification		BKG(SS)	SSSL	FTA-146-DEP01
Sample Number				CP0024
Sample Depth (feet)				0-1
Sample Date				09-Nov-98
Manganese	mg/kg	1.58E+03	3.63E+02	2.16E+03

Sample Identification		BKG(DS)	SSSL	FTA-146-GP09
Sample Number				CP0016
Sample Depth (feet)				9-13
Sample Date				06-Oct-98
Arsenic	mg/kg	1.83E+01	4.26E-01	2.21E+01
Iron	mg/kg	4.48E+04	2.35E+03	6.60E+04
Manganese	mg/kg	1.36E+03	3.63E+02	1.63E+03
Nickel	mg/kg	1.29E+01	1.54E+02	3.12E+02

Sample Identification		BKG(DS)	SSSL	FTA-146-GP10
Sample Number				CP0020
Sample Depth (feet)				9-13
Sample Date				06-Oct-98
Iron	mg/kg	4.48E+04	2.35E+03	5.00E+04

Sample Identification		BKG(SS)	BKG(DS)	SSSL	FTA-146-GP07	
Sample Number					CP0011	CP0012
Sample Depth (feet)					0-1	1-5
Sample Date					06-Oct-98	06-Oct-98
Arsenic	mg/kg	1.37E+01	1.83E+01	4.26E-01	1.38E+01	1.83E+01
Chromium	mg/kg	3.70E+01	3.83E+01	2.32E+01	4.00E+01 J	5.40E+01 J
Iron	mg/kg	3.42E+04	4.48E+04	2.35E+03	3.57E+04	7.97E+04

LEGEND

- UNIMPROVED ROADS
- PAVED ROADS / PARKING
- BUILDING
- TOPOGRAPHIC CONTOUR (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- FENCE
- UTILITY POLE
- TEMPORARY RESIDUUM WELL / GROUNDWATER SAMPLE LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- TEMPORARY RESIDUUM WELL / GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- DEPOSITIONAL SOIL SAMPLE LOCATION
- J THE COMPOUND/ANALYTE WAS POSITIVELY IDENTIFIED; THE REPORTED VALUE IS ESTIMATED.
- BKG BACKGROUND
- BKG(SS) SURFACE SOIL BACKGROUND VALUE
- BKG(DS) SUBSURFACE SOIL BACKGROUND VALUE
- SSSL SITE-SPECIFIC SCREENING LEVEL
- – CONCENTRATION WAS BELOW SSSL AND BACKGROUND
- mg/kg MILLIGRAMS PER KILOGRAM

FIGURE 5-1
PHASE I SOIL SAMPLE LOCATIONS EXCEEDING SSSLs AND BACKGROUND
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

DWG. NO.: ...\796887es.711
PROJ. NO.: 796887
INITIATOR: J. JENKINS
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 04/10/03
DRAWN BY: D. BOMAR
5/12/2004
9:36:24 AM
dbomar
c:\cadd\design\796887es.711

- Arsenic (13.8 and 14.2 mg/kg) exceeded its SSSL (0.43 mg/kg) and background (13.7 mg/kg) at two sample locations (FTA-146-GP07 and FTA-146-GP08).

- Chromium (40 mg/kg) exceeded its SSSL (23.2 mg/kg) and background (37 mg/kg) at one sample location (FTA-146-GP07).

- Iron (37,400 and 35,700 mg/kg) exceeded its SSSL (2,345 mg/kg) and background (34,154 mg/kg) at two sample locations (FTA-146-GP05 and FTA-146-GP07).

- Manganese (2,160 mg/kg) exceeded its SSSL (363 mg/kg) and background (1,579 mg/kg) at one sample location (FTA-146-DEP01).

Twelve metals were detected at concentrations exceeding their respective ESVs: aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, selenium, vanadium, and zinc. Of these, the following metals results also exceeded their respective background values in one or more samples:

- Arsenic (13.8 and 14.2 mg/kg) exceeded its ESV (10 mg/kg) and background (13.7 mg/kg) at two sample locations (FTA-146-GP07 and FTA-146-GP08).

- Cadmium (3.3 mg/kg) exceeded its ESV (1.6 mg/kg) and background (0.29 mg/kg) at one sample location (FTA-146-DEP01).

- Chromium (40 mg/kg) exceeded its ESV (0.4 mg/kg) and background (37 mg/kg) at one sample location (FTA-146-GP07).

- Cobalt (61.4 mg/kg) exceeded its ESV (20 mg/kg) and background (15.2 mg/kg) at one sample location (FTA-146-GP05).

- Copper (41.2 mg/kg) exceeded its ESV (40 mg/kg) and background (12.7 mg/kg) at one sample location (FTA-146-DEP01).

- Iron (37,400 and 35,700 mg/kg) exceeded its ESV (200 mg/kg) and background (34,154 mg/kg) at two sample locations (FTA-146-GP05 and FTA-146-GP07).

- Lead (135 mg/kg) exceeded its ESV (50 mg/kg) and background (40.1 mg/kg) at one sample location (FTA-146-DEP01).

- Manganese (2,160 mg/kg) exceeded its ESV (100 mg/kg) and background (1,579 mg/kg) at one sample location (FTA-146-DEP01).

- Selenium (1.1 to 1.7 mg/kg) exceeded its ESV (0.81 mg/kg) and background (0.48 mg/kg) at four sample locations (FTA-146-DEP01, FTA-146-GP05, FTA-146-GP06, and FTA-146-GP07).

- Zinc (193 and 618 mg/kg) exceeded its ESV (50 mg/kg) and background (40.6 mg/kg) at two sample locations (FTA-146-DEP01 and FTA-146-GP05).

Volatile Organic Compounds. A total of 14 VOCs were detected in the surface and depositional soil samples at concentrations below their respective SSSLs. Five VOCs (1,2,4-trimethylbenzene, 1,2-dimethylbenzene, ethylbenzene, m,p-xylenes, and toluene) were detected at concentrations exceeding their respective ESVs at one sample location (FTA-146-GP10).

Semivolatile Organic Compounds. A total of 14 SVOCs, including 12 polynuclear aromatic hydrocarbon (PAH) compounds, were detected in the surface and depositional soil samples. Of these, the PAH benzo(a)pyrene was detected at concentrations (0.12 to 0.4 mg/kg) exceeding its SSSL (0.085 mg/kg) at three sample locations (FTA-146-GP05, FTA-146-GP06, and FTA-146-GP09). A total of four PAHs (benzo[a]pyrene, fluoranthene, phenanthrene, and pyrene) were detected at concentrations exceeding their respective ESVs at four surface soil locations (FTA-146-GP05, FTA-146-GP06, FTA-146-GP08, and FTA-146-GP09). However, all the PAH results were below their respective PAH background values.

5.2 Subsurface Soil Analytical Results

Thirteen subsurface soil samples were collected for chemical analysis during the Phase I investigation at Parcels 146(7), 212(7), 24(7), 25(7), and 73(7). Subsurface soil samples were collected at depths greater than 1-foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-2. Figure 5-1 shows soil sample locations with results exceeding SSSLs and background values.

Metals. A total of 19 metals were detected in the subsurface soil samples. The concentrations of six metals (aluminum, arsenic, chromium, iron, manganese, and nickel) exceeded their respective SSSLs and background values as follows:

- Aluminum (14,000 and 17,100 mg/kg) exceeded its SSSL (7,803 mg/kg) and background (13,591 mg/kg) at two sample locations (FTA-146-GP08 and FTA-146-GP11).

- Arsenic (18.3 to 25.4 mg/kg) exceeded its SSSL (0.426 mg/kg) and background (18.3 mg/kg) at three sample locations (FTA-146-GP07, FTA-146-GP08, and FTA-146-GP09).

- Chromium (54 mg/kg) exceeded its SSSL (23.2 mg/kg) and background (38.3 mg/kg) at one sample location (FTA-146-GP07).

- Iron (46,500 to 90,000 mg/kg) exceeded its SSSL (2,345 mg/kg) and background (44,817 mg/kg) at five sample locations (FTA-146-GP05, FTA-146-GP07, FTA-146-GP08, FTA-146-GP09, and FTA-146-GP10).

- Manganese (1,630 mg/kg) exceeded its SSSL (363 mg/kg) and background (1,355 mg/kg) at one sample location (FTA-146-GP09).

- Nickel (312 mg/kg) exceeded its SSSL (154 mg/kg) and background (12.9 mg/kg) at one sample location (FTA-146-GP09).

Volatile Organic Compounds. A total of 20 VOCs were detected in the subsurface soil samples at concentrations (0.0019 to 0.59 mg/kg) below their respective SSSLs.

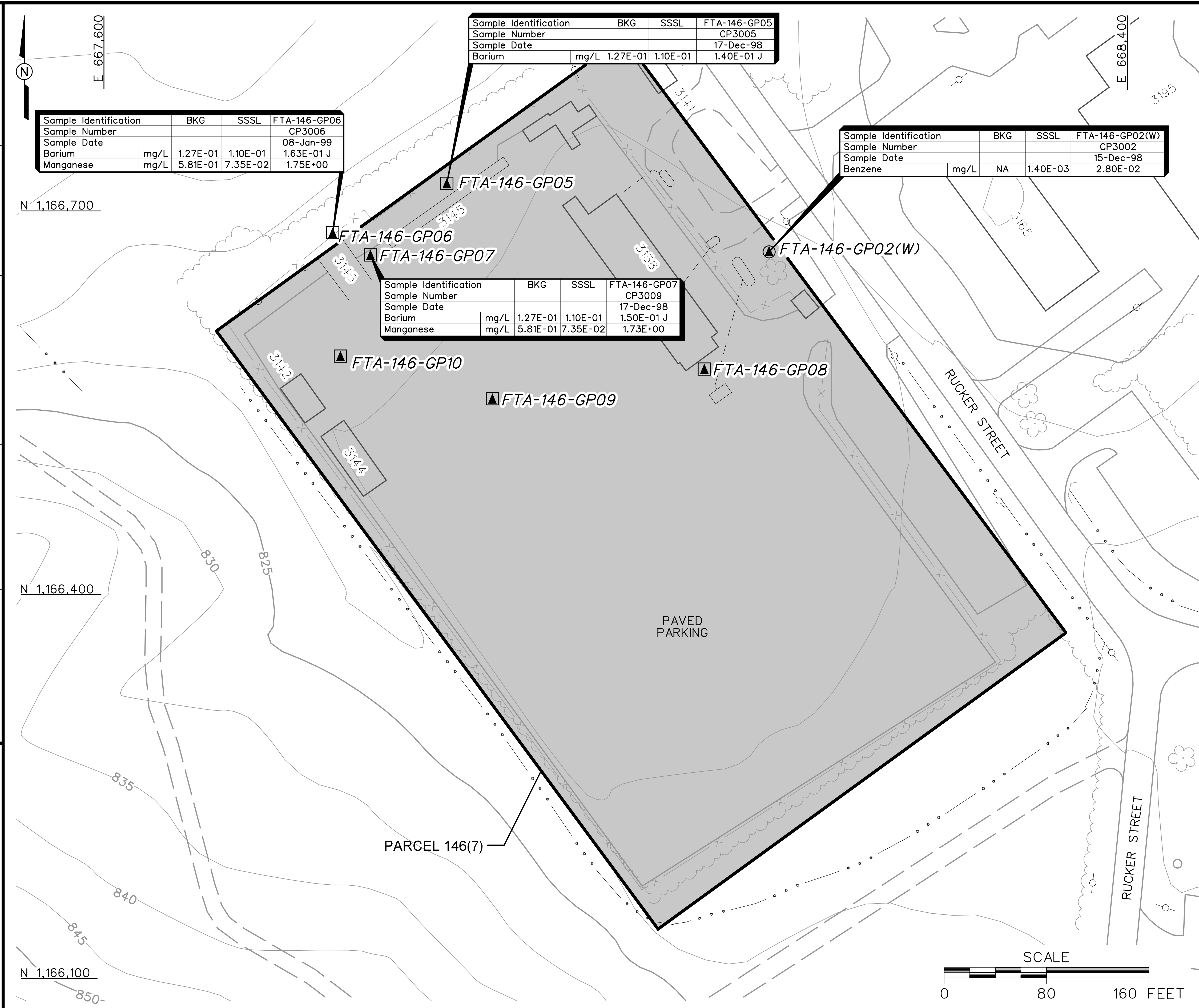
Semivolatile Organic Compounds. A total of 17 SVOCs, including 15 PAH compounds, were detected in the subsurface soil samples collected at the site. All of the SVOC concentrations were below their respective SSSLs with the exception of the PAH benzo(a)pyrene (0.086 mg/kg), which marginally exceeded its SSSL (0.085 mg/kg) at sample location FTA-146-GP12.

5.3 Groundwater Analytical Results

A total of 29 groundwater samples were collected from 16 monitoring wells during the three phases of investigations at Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7). The well locations are shown on Figures 3-1 through 3-3. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Tables 5-3 through 5-5. Groundwater sample locations with results exceeding SSSLs are show on Figures 5-2 , 5-3, and 5-4.

Metals. Seven groundwater samples (locations FTA-146-GP02, FTA-146-GP05, FTA-146-GP06, FTA-146-GP07, FTA-146-GP08, FTA-146-GP09, and FTA-146-GP10) were analyzed for metals during the Phase I investigation. A total of 17 metals were detected in the samples. The concentrations of eight metals (aluminum, barium, cadmium, chromium, iron, manganese, nickel, and thallium) exceeded their respective SSSLs. Of these, the following metals results also exceeded their respective background concentrations:

- Barium (0.14 to 0.16 mg/L) exceeded its SSSL (0.11 mg/L) and background (0.13 mg/L) at three sample locations (FTA-146-GP05, FTA-146-GP06, and FTA-146-



Sample Identification		BKG	SSSL	FTA-146-GP05
Sample Number				CP3005
Sample Date				17-Dec-98
Barium	mg/L	1.27E-01	1.10E-01	1.40E-01 J

Sample Identification		BKG	SSSL	FTA-146-GP06
Sample Number				CP3006
Sample Date				08-Jan-99
Barium	mg/L	1.27E-01	1.10E-01	1.63E-01 J
Manganese	mg/L	5.81E-01	7.35E-02	1.75E+00

Sample Identification		BKG	SSSL	FTA-146-GP02(W)
Sample Number				CP3002
Sample Date				15-Dec-98
Benzene	mg/L	NA	1.40E-03	2.80E-02

Sample Identification		BKG	SSSL	FTA-146-GP07
Sample Number				CP3009
Sample Date				17-Dec-98
Barium	mg/L	1.27E-01	1.10E-01	1.50E-01 J
Manganese	mg/L	5.81E-01	7.35E-02	1.73E+00

LEGEND

UNIMPROVED ROADS
PAVED ROADS / PARKING
BUILDING
TOPOGRAPHIC CONTOUR (CONTOUR INTERVAL - 5 FOOT)
TREES / TREELINE
PARCEL BOUNDARY
SURFACE DRAINAGE / CREEK
FENCE
UTILITY POLE
TEMPORARY RESIDUUM WELL / GROUNDWATER SAMPLE LOCATION
TEMPORARY RESIDUUM WELL / GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
J THE COMPOUND/ANALYTE WAS POSITIVELY IDENTIFIED; THE REPORTED VALUE IS ESTIMATED.
BKG BACKGROUND
SSSL SITE-SPECIFIC SCREENING LEVEL
mg/L MILLIGRAMS PER LITER
NA NOT AVAILABLE

NOTE:

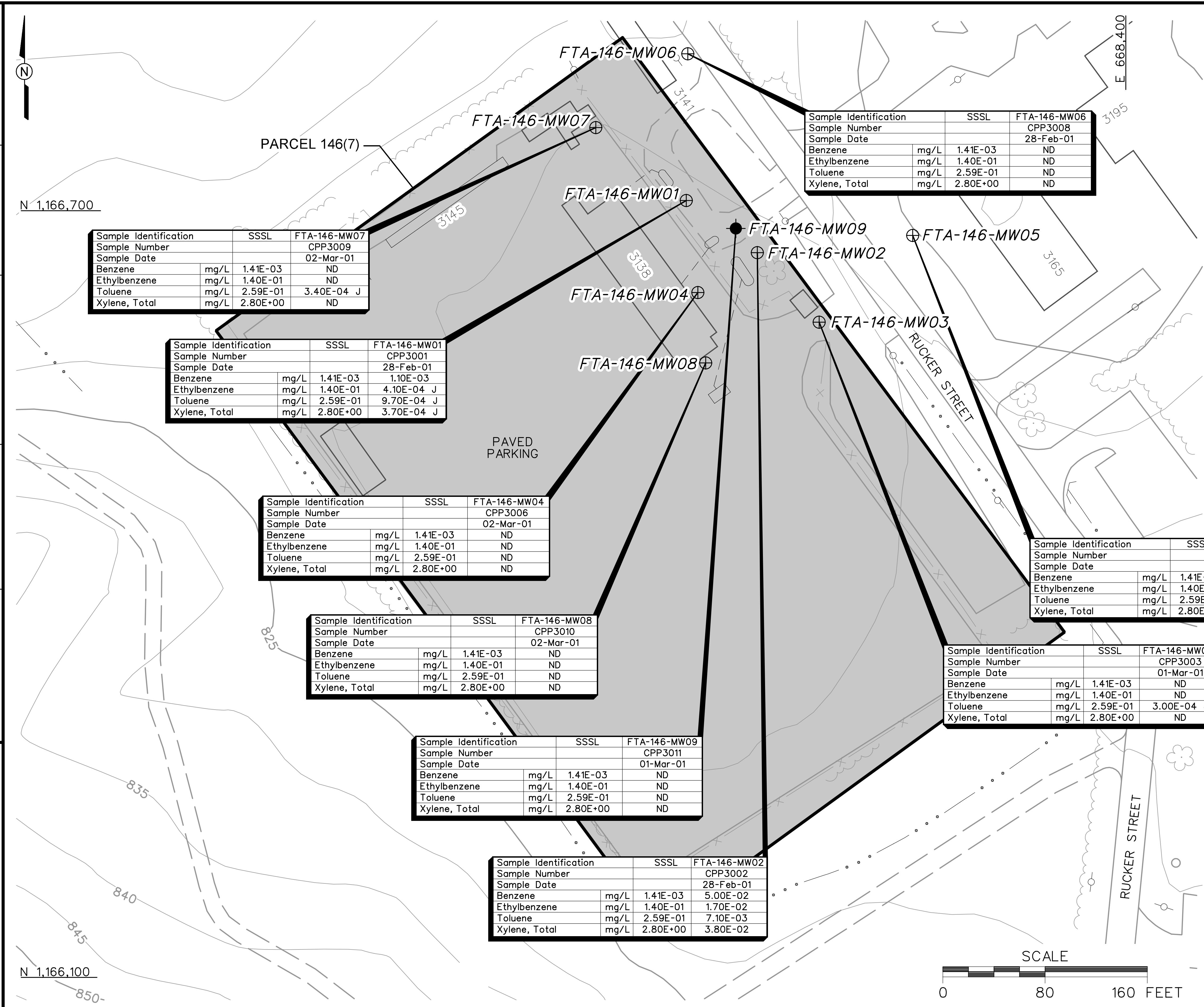
1. "B"-FLAGGED DATA NOT SHOWN.

FIGURE 5-2
PHASE I GROUNDWATER SAMPLE LOCATIONS EXCEEDING SSSLs AND BACKGROUND
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

DWG. NO.: ...\796887es.705
PROJ. NO.: 796887
INITIATOR: J. JENKINS
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 04/10/03
DRAWN BY: D. BOMAR
5/12/2004 9:33:30 AM
dbomar c:\cadd\design\796887es.705



Sample Identification		SSSL	FTA-146-MW06
Sample Number			CPP3008
Sample Date			28-Feb-01
Benzene	mg/L	1.41E-03	ND
Ethylbenzene	mg/L	1.40E-01	ND
Toluene	mg/L	2.59E-01	ND
Xylene, Total	mg/L	2.80E+00	ND

Sample Identification		SSSL	FTA-146-MW07
Sample Number			CPP3009
Sample Date			02-Mar-01
Benzene	mg/L	1.41E-03	ND
Ethylbenzene	mg/L	1.40E-01	ND
Toluene	mg/L	2.59E-01	3.40E-04 J
Xylene, Total	mg/L	2.80E+00	ND

Sample Identification		SSSL	FTA-146-MW01
Sample Number			CPP3001
Sample Date			28-Feb-01
Benzene	mg/L	1.41E-03	1.10E-03
Ethylbenzene	mg/L	1.40E-01	4.10E-04 J
Toluene	mg/L	2.59E-01	9.70E-04 J
Xylene, Total	mg/L	2.80E+00	3.70E-04 J

Sample Identification		SSSL	FTA-146-MW04
Sample Number			CPP3006
Sample Date			02-Mar-01
Benzene	mg/L	1.41E-03	ND
Ethylbenzene	mg/L	1.40E-01	ND
Toluene	mg/L	2.59E-01	ND
Xylene, Total	mg/L	2.80E+00	ND

Sample Identification		SSSL	FTA-146-MW05
Sample Number			CPP3007
Sample Date			15-Feb-01
Benzene	mg/L	1.41E-03	ND
Ethylbenzene	mg/L	1.40E-01	ND
Toluene	mg/L	2.59E-01	ND
Xylene, Total	mg/L	2.80E+00	ND

Sample Identification		SSSL	FTA-146-MW08
Sample Number			CPP3010
Sample Date			02-Mar-01
Benzene	mg/L	1.41E-03	ND
Ethylbenzene	mg/L	1.40E-01	ND
Toluene	mg/L	2.59E-01	ND
Xylene, Total	mg/L	2.80E+00	ND

Sample Identification		SSSL	FTA-146-MW03
Sample Number			CPP3003
Sample Date			01-Mar-01
Benzene	mg/L	1.41E-03	ND
Ethylbenzene	mg/L	1.40E-01	ND
Toluene	mg/L	2.59E-01	3.00E-04 J
Xylene, Total	mg/L	2.80E+00	ND

Sample Identification		SSSL	FTA-146-MW09
Sample Number			CPP3011
Sample Date			01-Mar-01
Benzene	mg/L	1.41E-03	ND
Ethylbenzene	mg/L	1.40E-01	ND
Toluene	mg/L	2.59E-01	ND
Xylene, Total	mg/L	2.80E+00	ND

Sample Identification		SSSL	FTA-146-MW02
Sample Number			CPP3002
Sample Date			28-Feb-01
Benzene	mg/L	1.41E-03	5.00E-02
Ethylbenzene	mg/L	1.40E-01	1.70E-02
Toluene	mg/L	2.59E-01	7.10E-03
Xylene, Total	mg/L	2.80E+00	3.80E-02

LEGEND

- UNIMPROVED ROADS
- PAVED ROADS / PARKING
- BUILDING
- TOPOGRAPHIC CONTOUR (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- CULVERT WITH HEADWALL
- FENCE
- UTILITY POLE
- RESIDUUM MONITORING WELL LOCATION
- BEDROCK MONITORING WELL LOCATION

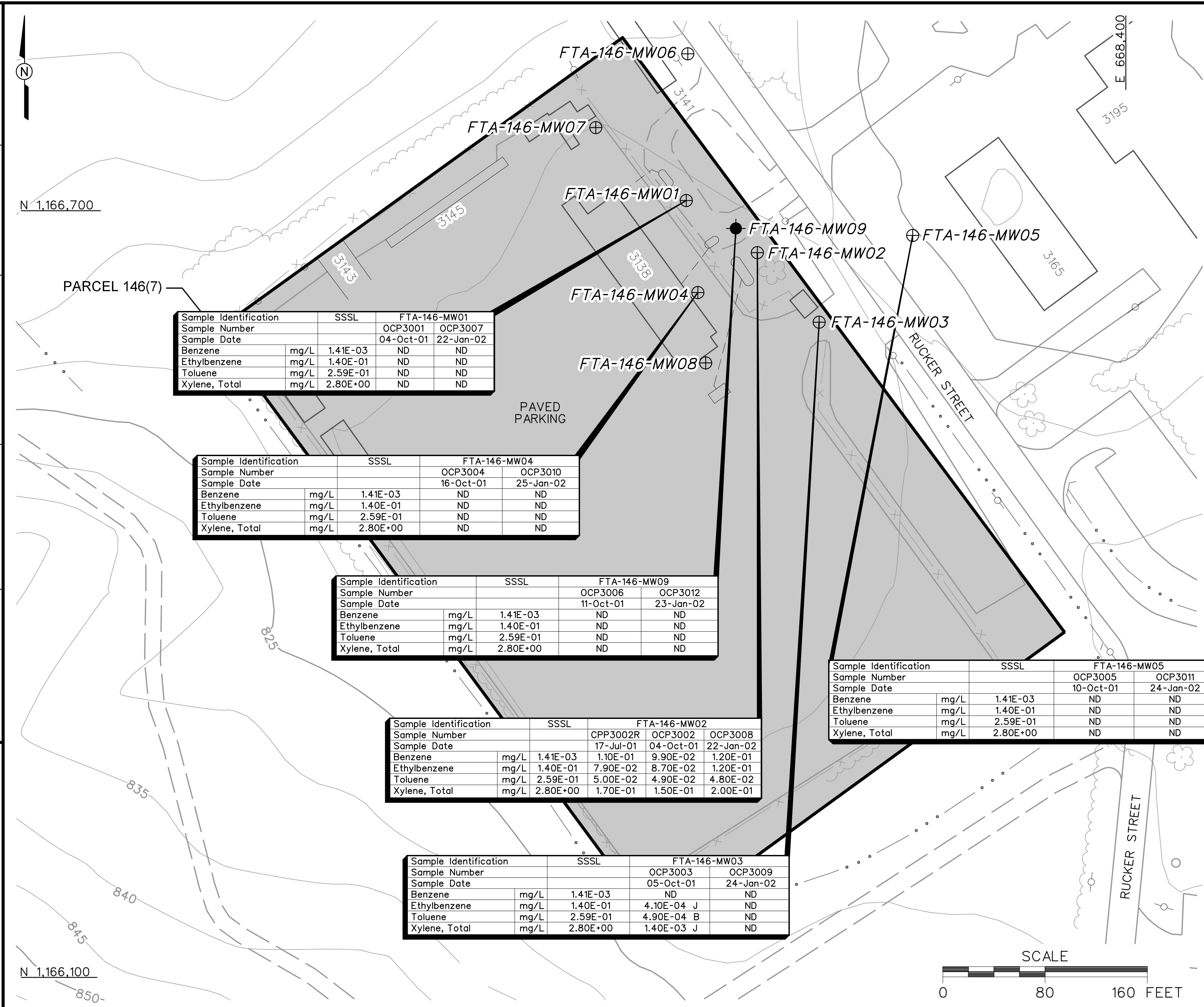
J	THE COMPOUND/ANALYTE WAS POSITIVELY IDENTIFIED; THE REPORTED VALUE IS ESTIMATED.
SSSL	SITE-SPECIFIC SCREENING LEVEL
mg/L	MILLIGRAMS PER LITER
ND	NOT DETECTED
BTEX	BENZENE, TOLUENE, ETHYLBENZENE, XYLENE

FIGURE 5-3
PHASE II GROUNDWATER SAMPLE RESULTS FOR BTEX
FORMER MOTOR POOL AREA 3100
PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

DWG. NO.: ...\796887es.721
PROJ. NO.: 796887
INITIATOR: J. JENKINS
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: S. MORAN
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 04/10/03
DRAWN BY: D. BOMAR
5/1/2004 9:27:29 AM
dbomar c:\cadd\design\796887es.721



Sample Identification		SSSL	FTA-146-MW01	
Sample Number			OCP3001	OCP3007
Sample Date			04-Oct-01	22-Jan-02
Benzene	mg/L	1.41E-03	ND	ND
Ethylbenzene	mg/L	1.40E-01	ND	ND
Toluene	mg/L	2.59E-01	ND	ND
Xylene, Total	mg/L	2.80E+00	ND	ND

Sample Identification		SSSL	FTA-146-MW04	
Sample Number			OCP3004	OCP3010
Sample Date			16-Oct-01	25-Jan-02
Benzene	mg/L	1.41E-03	ND	ND
Ethylbenzene	mg/L	1.40E-01	ND	ND
Toluene	mg/L	2.59E-01	ND	ND
Xylene, Total	mg/L	2.80E+00	ND	ND

Sample Identification		SSSL	FTA-146-MW09	
Sample Number			OCP3006	OCP3012
Sample Date			11-Oct-01	23-Jan-02
Benzene	mg/L	1.41E-03	ND	ND
Ethylbenzene	mg/L	1.40E-01	ND	ND
Toluene	mg/L	2.59E-01	ND	ND
Xylene, Total	mg/L	2.80E+00	ND	ND

Sample Identification		SSSL	FTA-146-MW02		
Sample Number			CPP3002R	OCP3002	OCP3008
Sample Date			17-Jul-01	04-Oct-01	22-Jan-02
Benzene	mg/L	1.41E-03	1.10E-01	9.90E-02	1.20E-01
Ethylbenzene	mg/L	1.40E-01	7.90E-02	8.70E-02	1.20E-01
Toluene	mg/L	2.59E-01	5.00E-02	4.90E-02	4.80E-02
Xylene, Total	mg/L	2.80E+00	1.70E-01	1.50E-01	2.00E-01

Sample Identification		SSSL	FTA-146-MW05	
Sample Number			OCP3005	OCP3011
Sample Date			10-Oct-01	24-Jan-02
Benzene	mg/L	1.41E-03	ND	ND
Ethylbenzene	mg/L	1.40E-01	ND	ND
Toluene	mg/L	2.59E-01	ND	ND
Xylene, Total	mg/L	2.80E+00	ND	ND

Sample Identification		SSSL	FTA-146-MW03	
Sample Number			OCP3003	OCP3009
Sample Date			05-Oct-01	24-Jan-02
Benzene	mg/L	1.41E-03	ND	ND
Ethylbenzene	mg/L	1.40E-01	4.10E-04 J	ND
Toluene	mg/L	2.59E-01	4.90E-04 B	ND
Xylene, Total	mg/L	2.80E+00	1.40E-03 J	ND

LEGEND

UNIMPROVED ROADS
PAVED ROADS / PARKING
BUILDING
TOPOGRAPHIC CONTOUR (CONTOUR INTERVAL - 5 FOOT)
TREES / TREELINE
PARCEL BOUNDARY
SURFACE DRAINAGE / CREEK
CULVERT WITH HEADWALL
FENCE
UTILITY POLE
RESIDUUM MONITORING WELL LOCATION
BEDROCK MONITORING WELL LOCATION

J THE COMPOUND/ANALYTE WAS POSITIVELY IDENTIFIED; THE REPORTED VALUE IS ESTIMATED.

B ANALYTE DETECTED IN LABORATORY OR FIELD BLANK AT CONCENTRATIONS GREATER THAN THE REPORTING LIMIT (AND GREATER THAN ZERO)

SSSL SITE-SPECIFIC SCREENING LEVEL

mg/L MILLIGRAMS PER LITER

ND NOT DETECTED

BTEX BENZENE, TOLUENE, ETHYLBENZENE, XYLENE

NOTE:

1. MONITORING WELLS FTA-146-MW06, FTA-146-MW07, AND FTA-146-MW08 WERE NOT INCLUDED IN PHASE III SAMPLING.

FIGURE 5-4
PHASE III GROUNDWATER SAMPLE RESULTS FOR BTEX FORMER MOTOR POOL AREA 3100 PARCELS 146(7), 212(7), 24(7), 25(7) AND 73(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

Shaw Environmental, Inc.

DWG. NO.: ...\796887es.722
PROJ. NO.: 796887
INITIATOR: J. JENKINS
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: S. MORAN
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 04/10/03
DRAWN BY: D. BOMAR
5/12/2004 9:23:13 AM
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GP07). All of the barium results were flagged with a "J" data qualifier, indicating that the results were estimated.

- Cadmium (0.0053 mg/L) exceeded its SSSL (0.00078 mg/L) and background (0.0025 mg/L) at one sample location (FTA-146-GP09). The cadmium result was flagged with a "B" data qualifier, indicating that cadmium was also detected in an associated laboratory or field blank sample.

- Manganese (1.73 and 1.75 mg/L) exceeded its SSSL (0.074 mg/L) and background (0.581 mg/L) at two sample locations (FTA-146-GP06 and FTA-146-GP07).

- Thallium (0.0045 to 0.005 mg/L) exceeded its SSSL (0.0001 mg/L) and background (0.00146 mg/L) at four sample locations (FTA-146-GP02, FTA-146-GP07, FTA-146-GP09, and FTA-146-GP10). All of the thallium results were flagged with a "B" data qualifier, indicating that thallium was also detected in an associated laboratory or field blank sample.

Volatile Organic Compounds. Seven groundwater samples (locations FTA-146-GP02, FTA-146-GP05, FTA-146-GP06, FTA-146-GP07, FTA-146-GP08, FTA-146-GP09, and FTA-146-GP10) were analyzed for VOCs during the Phase I investigation. A total of eight VOCs (1,2,4-trimethylbenzene, 4-methyl-2-pentanone, acetone, benzene, chloroform, ethylbenzene, hexachlorobutadiene, and toluene) were detected in the samples. All of the VOC results were below their respective SSSLs with the exception of benzene (0.028 mg/L), which exceeded its SSSL (0.0014 mg/L) at one temporary well location (FTA-146-GP02).

Semivolatile Organic Compounds. Seven groundwater samples (locations FTA-146-GP02, FTA-146-GP05, FTA-146-GP06, FTA-146-GP07, FTA-146-GP08, FTA-146-GP09, and FTA-146-GP10) were analyzed for SVOCs during the Phase I investigation. One SVOC (di-n-butyl phthalate) was detected in six of the samples at estimated concentrations below its SSSL.

BTEX. A total of 22 groundwater samples, collected from nine well locations (FTA-146-MW01 through FTA-146-MW09), were analyzed for BTEX compounds during the Phase II and Phase III investigations.

- ***Benzene.*** Benzene was detected in five groundwater samples collected from two well locations (FTA-146-MW01 and FTA-146-MW02). Four of the benzene results (0.05 to 0.12 mg/L), all from well location FTA-146-MW02, exceeded its SSSL (0.0014 mg/L).

- ***Ethylbenzene.*** Ethylbenzene was detected in six groundwater samples collected from three well locations (FTA-146-MW01, FTA-146-MW02, and FTA-146-MW03). All of the ethylbenzene results were below its SSSL.

- ***Toluene.*** Toluene was detected in eight groundwater samples collected from four well locations (FTA-146-MW01, FTA-146-MW02, FTA-146-MW03, and FTA-146-MW07). All of the toluene results were below its SSSL.

- ***Xylene.*** Xylene was detected in six groundwater samples collected from three well locations (FTA-146-MW01, FTA-146-MW02, and FTA-146-MW03). All of the xylene results were below its SSSL.

5.4 Statistical and Geochemical Evaluation of Site Metals Data

Site metals data were further evaluated using statistical and geochemical methods to determine if the metals detected in site media are site related (Appendix J). This multi-tiered approach is described in the Shaw technical memorandum "Selecting Site-Related Chemicals for Human Health and Ecological Risk Assessments for FTMC: Revision 2" (Shaw, 2003). The statistical and geochemical evaluations determined that the metals detected in site media were all naturally occurring, except for the following metals in a limited number of soil samples:

- Beryllium (9.4 mg/kg) at subsurface soil sample location FTA-146-GP09.

- Cobalt (61.4 and 225 mg/kg) at surface soil sample location FTA-146-GP05 and subsurface soil sample location FTA-146-GP09.

- Nickel (312 mg/kg) at subsurface soil sample location FTA-146-GP09.

- Selenium (3.8 mg/kg) at subsurface soil sample location FTA-146-GP12.

- Zinc (193 to 651 mg/kg) at two surface soil sample locations (FTA-146-GP05 and FTA-146-DEP01) and two subsurface soil sample locations (FTA-146-GP07 and FTA-146-GP09).

6.0 Summary, Conclusions, and Recommendations

Shaw completed an SI at Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7) at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site as a result of historical mission-related Army activities. The SI consisted of the collection and analysis of six surface soil samples, one depositional soil sample, 13 subsurface soil samples, and 29 groundwater samples. In addition, 16 monitoring wells were installed at the site to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information. In addition, Shaw removed three USTs at the Former Motor Pool Area 3100. USTs, piping, and impacted soils were removed for a 2,500-gallon waste oil tank (Parcel 24[7]), a 3,000-gallon heating oil tank (Parcel 212[7]), and a 10,000-gallon diesel tank (Parcel 25[7]).

Chemical analysis of samples collected at the site indicates that metals, VOCs, SVOCs, and BTEX compounds were detected in site media. Analytical results were compared to SSSLs, ESVs, and background screening values developed for human health and ecological risk evaluations as part of investigations performed under the BRAC Environmental Restoration Program at FTMC. Site metals data were also evaluated using statistical and geochemical methods to select site-related metals.

Although the site is projected for mixed business reuse (EDAW, Inc., 1997), the analytical data were screened against residential SSSLs to determine if the site is suitable for unrestricted reuse. Constituents detected at concentrations exceeding SSSLs and background (where available) were identified as chemicals of potential concern (COPC) in site media. COPCs included four metals (arsenic, chromium, iron, and manganese) in surface soil; six metals (aluminum, arsenic, chromium, iron, manganese, and nickel) and one PAH compound (benzo[a]pyrene) in subsurface soil; and four metals (barium, chromium, manganese, and nickel) and one VOC (benzene) in groundwater. With the exception of nickel in subsurface soil, the metals COPCs were determined to be present at naturally occurring levels. Although nickel exceeded its SSSL in one subsurface soil sample collected at 9 to 13 feet bgs, all other nickel results in soil were below the SSSL and were determined to be present at naturally occurring levels. Based on historical site activities, it is uncertain whether nickel is a site-related contaminant. Given the depth at which nickel was encountered and its limited spatial distribution in soil, nickel is not expected to pose a threat to human health. The PAH compound benzo(a)pyrene (0.086 mg/kg) exceeded its SSSL (0.085 mg/kg) in one subsurface soil sample collected from 8 to 12 feet bgs at a location between the waste oil UST and the diesel UST. The USTs were removed, surrounding impacted soils were excavated, and confirmation sampling was performed in accordance with ADEM UST closure requirements. Thus, only benzene in groundwater is retained as a chemical of concern.

Benzene concentrations (0.05 to 0.12 mg/L) exceeded its SSSL (0.0014 mg/L) in four samples collected from monitoring well FTA-146-MW02 from February 2001 to January 2002. Monitoring well FTA-146-MW02 is adjacent to the location of the USTs that were removed in 2002. Data from the last three rounds of sampling at monitoring well FTA-146-MW02, collected prior to removal of the USTs, showed that the benzene concentration in groundwater ranged from approximately 0.1 to 0.12 mg/L. The affected area is localized around FTA-146-MW02 and the source of the benzene has been removed. Benzene was also detected in one other permanent monitoring well (FTA-146-MW01) but at a level below its SSSL.

Constituents detected at concentrations exceeding ESVs and background (where available) were identified as constituents of potential ecological concern (COPEC) in surface soil. COPECs were ten metals (arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, selenium, and zinc) in a limited number of samples and five VOCs (1,2,4-trimethylbenzene, 1,2-dimethylbenzene, ethylbenzene, xylene, and toluene) in one sample. The metals COPECs were determined to be present at naturally occurring levels except for cobalt at one location (FTA-146-GP05) and zinc at two locations (FTA-146-GP05 and FTA-146-DEP01). These locations appear to be isolated "hot spots." Similarly, the VOCs identified as COPECs were present at low levels exceeding ESVs at only one location (FTA-146-GP10). The COPECs identified at Motor Pool Area 3100 would have the potential to pose risks to ecological receptors living and feeding in the immediate vicinity of the hot spots if the site provided viable ecological habitat. However, the site is covered with buildings and concrete/asphalt pavement and does not provide ecological habitat. Furthermore, the projected reuse of this site will likely preclude development of ecological habitat in the future.

Based on the results of the SI, past operations at Former Motor Pool Area 3100 have impacted the environment. Benzene is present in groundwater at levels that may pose an unacceptable risk to human health. Furthermore, groundwater contamination (i.e., chlorinated VOCs) is being investigated at the Training Area T-5 sites, adjacent to Motor Pool Area 3100, and may be impacting groundwater in the southern portion of Parcel 146(7). Therefore, Shaw recommends implementing land-use controls to restrict groundwater use at Former Motor Pool Area 3100, Parcels 146(7), 212(7), 24(7), 25(7), and 73(7).

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	2,4,5-trichlorophenoxypropionic acid
3D	3D International Environmental Group
AB	ambient blank
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded
ABLM	adult blood lead model
Abs	skin absorption
ABS	dermal absorption factor
AC	hydrogen cyanide
ACAD	AutoCadd
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
AdE	Anniston and Allen stony loam, 10 to 25 percent slope
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Center
AEDA	ammunition, explosives, and other dangerous articles
AEL	airborne exposure limit
AET	adverse effect threshold
AF	soil-to-skin adherence factor
AHA	ammunition holding area
AL	Alabama
ALARNG	Alabama Army National Guard
ALAD	δ-aminolevulinic acid dehydratase
ALDOT	Alabama Department of Transportation
amb.	amber
amsl	above mean sea level
ANAD	Anniston Army Depot
AOC	area of concern
AP	armor piercing
APEC	areas of potential ecological concern
APT	armor-piercing tracer
AR	analysis request
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
AS/SVE	air sparging/soil vapor extraction
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AT	averaging time
atm-m^3/mol	atmospheres per cubic meter per mole
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
AUF	area use factor
AWARE	Associated Water and Air Resources Engineers, Inc.
AWQC	ambient water quality criteria
AWWSB	Anniston Water Works and Sewer Board
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCF	blank correction factor; bioconcentration factor
BCT	BRAC Cleanup Team
BERA	baseline ecological risk assessment
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BG	Bacillus globigii
BGR	Bains Gap Road
bgs	below ground surface
BHC	hexachlorocyclohexane
BHHRA	baseline human health risk assessment
BIRTC	Branch Immaterial Replacement Training Center
bkg	background
bls	below land surface
BOD	biological oxygen demand
Bp	soil-to-plant biotransfer factors
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSAF	biota-to-sediment accumulation factors
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare; body weight
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
$CaCO_3$	calcium carbonate
CAA	Clean Air Act
CAB	chemical warfare agent breakdown products
CACM	Chemical Agent Contaminated Media
CAMU	corrective action management unit
CBR	chemical, biological, and radiological
CCAL	continuing calibration
CCB	continuing calibration blank
CCV	continuing calibration verification
CD	compact disc
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CF	conversion factor
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
CG	phosgene (carbonyl chloride)
CGI	combustible gas indicator
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CIH	Certified Industrial Hygienist
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl	chlorinated
CLP	Contract Laboratory Program
cm	centimeter
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
CO	carbon monoxide
CO_2	carbon dioxide
Co-60	cobalt-60
CoA	Code of Alabama
COC	chain of custody; chemical of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	chemical of potential concern
COPEC	constituent of potential ecological concern
CPOM	coarse particulate organic matter
CPSS	chemicals present in site samples
CQCSM	Contract Quality Control System Manager
CRDL	contract-required detection limit
CRL	certified reporting limit
CRQL	contract-required quantitation limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
CSM	conceptual site model
CT	central tendency
ctr.	container
CWA	chemical warfare agent; Clean Water Act
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
'D'	duplicate; dilution
D&I	detection and identification
DAAMS	depot area agent monitoring station

DAF	dilution-attenuation factor
DANC	decontamination agent, non-corrosive
ºC	degrees Celsius
ºF	degrees Fahrenheit
DCA	dichloroethane
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEHP	di(2-ethylhexyl)phthalate
DEP	depositional soil
DFTPP	decafluorotriphenylphosphine
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DM	dry matter; adamsite
DMBA	dimethylbenz(a)anthracene
DMMP	dimethylmethylphosphonate
DNAPL	dense nonaqueous-phase liquid
DO	dissolved oxygen
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DSERTS	Defense Site Environmental Restoration Tracking System
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EB	equipment blank
EBS	environmental baseline survey
EC_{20}	effects concentration for 20 percent of a test population
EC_{50}	effects concentration for 50 percent of a test population
ECBC	Edgewood Chemical Biological Center
ED	exposure duration
EDD	electronic data deliverable
EF	exposure frequency
EDQL	ecological data quality level
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EMI	Environmental Management Inc.
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
EPRI	Electrical Power Research Institute
EPT	Ephemeroptera, Plecoptera, Trichoptera
ER	equipment rinsate
ERA	ecological risk assessment
ER-L	effects range-low
ER-M	effects range-medium
ESE	Environmental Science and Engineering, Inc.
ESL	ecological screening level
ESMP	Endangered Species Management Plan
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
ET	exposure time
EU	exposure unit
Exp.	Explosives
EXTOXNET	Extension Toxicology Network
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FBI	Family Biotic Index
FD	field duplicate
FDC	Former Decontamination Complex
FDA	U.S. Food and Drug Administration
Fe^{+3}	ferric iron
Fe^{+2}	ferrous iron
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Act
FFE	field flame expedient
FFS	focused feasibility study
FI	fraction of exposure
Fil	filtered
Flt	filtered
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
f_{oc}	fraction organic carbon
FOMRA	Former Ordnance Motor Repair Area
FOST	Finding of Suitability to Transfer
Foster Wheeler	Foster Wheeler Environmental Corporation
FR	Federal Register
Frtn	fraction
FS	field split; feasibility study
FSP	field sampling plan
ft	feet
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRA	FTMC Reuse & Redevelopment Authority
g	gram
g/m^3	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
GAF	gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin (isopropyl methylphosphonofluoridate)
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GCL	geosynthetic clay liner
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GRA	general response action
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
H&S	health and safety
HA	hand auger
HC	mixture of hexachloroethane, aluminum powder, and zinc oxide (smoke producer)
HCl	hydrochloric acid
HD	distilled mustard (bis-[dichloroethyl]sulfide)
HDPE	high-density polyethylene
HE	high explosive
HEAST	Health Effects Assessment Summary Tables
Herb.	herbicides
HHRA	human health risk assessment
HI	hazard index

H_2O_2	hydrogen peroxide
HPLC	high-performance liquid chromatography
HNO_3	nitric acid
HQ	hazard quotient
HQ_{screen}	screening-level hazard quotient
hr	hour
HRC	hydrogen releasing compound
HSA	hollow-stem auger
HSDB	Hazardous Substance Data Bank
HTRW	hazardous, toxic, and radioactive waste
'I'	out of control, data rejected due to low recovery
IASPOW	Impact Area South of POW Training Facility
IATA	International Air Transport Authority
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IF	ingestion factor; inhalation factor
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IR	ingestion rate
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
IS	internal standard
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System™
'J'	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
JPA	Joint Powers Authority
K	conductivity
K_d	soil-water distribution coefficient
kg	kilogram
KeV	kilo electron volt
K_{oc}	organic carbon partioning coefficient
K_{ow}	octonal-water partition coefficient
$KMnO_4$	potassium permanganate
L	liter; Lewisite (dichloro-[2-chloroethyl]sulfide)
L/kg/day	liters per kilogram per day
l	liter
LAW	light anti-tank weapon
lb	pound
LBP	lead-based paint
LC	liquid chromatography
LCS	laboratory control sample
LC_{50}	lethal concentration for 50 percent population tested
LD_{50}	lethal dose for 50 percent population tested
LEL	lower explosive limit
LOAEL	lowest-observed-advserse-effects-level
LOEC	lowest-observable-effect-concentration
LRA	land redevelopment authority
LT	less than the certified reporting limit
LUC	land-use control
LUCAP	land-use control assurance plan
LUCIP	land-use control implementation plan
max	maximum
MB	method blank
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MCPA	4-chloro-2-methylphenoxyacetic acid
MCPP	2-(2-methyl-4-chlorophenoxy)propionic acid
MCS	media cleanup standard
MD	matrix duplicate
MDC	maximum detected concentration
MDCC	maximum detected constituent concentration
MDL	method detection limit
mg	milligrams
mg/kg	milligrams per kilogram
mg/kg/day	milligram per kilogram per day
mg/kgbw/day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
MeV	mega electron volt
min	minimum
MINICAMS	miniature continuous air monitoring system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MMBtu/hr	million Btu per hour
MNA	monitored natural attenuation
MnO_4-	permanganate ion
MOA	Memorandum of Agreement
MOGAS	motor vehicle gasoline
MOUT	Military Operations in Urban Terrain
MP	Military Police
MPA	methyl phosphonic acid
MPC	maximum permissible concentration
MPM	most probable munition
MQL	method quantitation limit
MR	molasses residue
MRL	method reporting limit
MS	matrix spike
mS/cm	millisiemens per centimeter
mS/m	millisiemens per meter
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
MWI&MP	Monitoring Well Installation and Management Plan
Na	sodium
NA	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
$NaMnO_4$	sodium permanganate
NAVD88	North American Vertical Datum of 1988
NAS	National Academy of Sciences
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NCRP	National Council on Radiation Protection and Measurements
ND	not detected
NE	no evidence; northeast
ne	not evaluated
NEW	net explosive weight
NFA	No Further Action
NG	National Guard
NGP	National Guardsperson
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
Ni	nickel

NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
NO_3^-	nitrate
NOEC	no-observable-effect-concentration
NPDES	National Pollutant Discharge Elimination System
NPW	net present worth
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded; no risk
NRC	National Research Council
NRCC	National Research Council of Canada
NRHP	National Register of Historic Places
NRT	near real time
ns	nanosecond
N-S	north to south
NS	not surveyed
NSA	New South Associates, Inc.
nT	nanotesla
nT/m	nanoteslas per meter
NTU	nephelometric turbidity unit
nv	not validated
O_2	oxygen
O_3	ozone
O&G	oil and grease
O&M	operation and maintenance
OB/OD	open burning/open detonation
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
OH•	hydroxyl radical
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORC	Oxygen Releasing Compound
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
OWS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PBMS	performance-based measurement system
PC	permeability coefficient
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEF	particulate emission factor
PEL	permissible exposure limit
PERA	preliminary ecological risk assessment
PERC	perchloroethene
PES	potential explosive site
Pest.	pesticides
PETN	pentaerythritoltetranitrate
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
PM	project manager
POC	point of contact
POL	petroleum, oils, and lubricants
POTW	publicly owned treatment works
POW	prisoner of war
PP	peristaltic pump; Proposed Plan
ppb	parts per billion
ppbv	parts per billion by volume
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PR	potential risk
PRA	preliminary risk assessment
PRG	preliminary remediation goal
PS	chloropicrin
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	quality assurance manual
QAO	quality assurance officer
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
R	rejected data; resample; retardation factor
R&A	relevant and appropriate
RA	remedial action
RAO	remedial action objective
RBC	risk-based concentration; red blood cell
RBRG	risk-based remedial goal
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Material
RD	remedial design
RDX	cyclotrimethylenetrinitramine
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RfC	reference concentration
RfD	reference dose
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RME	reasonable maximum exposure
ROD	Record of Decision
RPD	relative percent difference
RR	range residue
RRF	relative response factor
RRSE	Relative Risk Site Evaluation
RSD	relative standard deviation
RTC	Recruiting Training Center
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
RWIMR	Ranges West of Iron Mountain Road
SA	exposed skin surface area
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
SARA	Superfund Amendments and Reauthorization Act
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDWA	Safe Drinking Water Act
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SF	cancer slope factor
SFSP	site-specific field sampling plan
SGF	standard grade fuels
Shaw	Shaw Environmental, Inc.
SHP	installation-wide safety and health plan
SI	site investigation

SINA	Special Interest Natural Area
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SMDP	Scientific Management Decision Point
s/n	signal-to-noise ratio
SO_4^{-2}	sulfate
SOD	soil oxidant demand
SOP	standard operating procedure
SOPQAM	U.S. EPA's *Standard Operating Procedure/Quality Assurance Manual*
sp	poorly graded sands; gravelly sands
SP	submersible pump
SPCC	system performance calibration compound
SPCS	State Plane Coordinate System
SPM	sample planning module
SQRT	screening quick reference tables
Sr-90	strontium-90
SRA	streamlined human health risk assessment
SRI	supplemental remedial investigation
SRM	standard reference material
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source-term concentration
STD	standard deviation
STEL	short-term exposure limit
STL	Severn-Trent Laboratories
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SUXOS	senior UXO supervisor
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA's *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SWMU	solid waste management unit
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TEA	triethylaluminum
Tetryl	trinitrophenylmethylnitramine
TERC	Total Environmental Restoration Contract
THI	target hazard index
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TNB	trinitrobenzene
TNT	trinitrotoluene
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TR	target cancer risk
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TRV	toxicity reference value
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average
UCL	upper confidence limit
UCR	upper certified range
'U'	not detected above reporting limit
UIC	underground injection control
UF	uncertainty factor
URF	unit risk factor
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VC	vinyl chloride
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards